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Authors are alone responsible for their respective statements.

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The

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ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY.*

By Major LEONARD DARWIN, President.

The Presidents of this Society must often have been tempted when delivering their annual addresses, and more especially when about permanently to resign their office, to make a broad survey of the history of the Society in the past, and on this basis, whilst looking into the future, to suggest lines on which it seems likely it will be able to continue to advance in the most profitable manner. As regards our past history, any one who reads with attention Sir Clements Markham's work entitled 'Fifty Years' Work of the Geographical Society,' must come to the conclusion that up to the year 1881, when it was published, the most useful part played by the Society had been the encouragement of pioneer expeditions to the least-known parts of the world. This encouragement was effected by means of the bestowal of medals and other awards, by grants of money to explorers to cover the cost of their journeys, and more rarely by the actual promotion of exploration. The Society was no doubt founded with the object of creating a library, of collecting maps, of publishing geographical literature, and of undertaking to instruct would-be travellers in surveying and other necessary acquirements; and in these directions excellent work had then been done. But the fact remains that that which must arouse the strongest feeling of pride amongst the Fellows of this Society when reviewing the first fifty years of its existence is the help it gave to those great explorers who made that period the most remarkable in the geographical history of the world. And if the encouragement of pioneer exploration was in fact the most useful function of this Society during its earlier history, this is also true in great measure as regards our work during the last thirty years. Our collection of maps and our library have no doubt increased

* Anniversary Meeting, May 22, 1911.

vastly in size and importance; our journal has established a world-wide reputation; the instruction given in Savile Row is both more extensive and more systematic; whilst a notable step has been taken by the Society in recent years in the encouragement given to the teaching of geography in the universities of the British Isles. But nevertheless it can hardly be doubted that if the work of this Society during this period is ever remembered in the distant future, it will be because of our connection with the many travellers who have thrown light on the unknown world, and whom we have felt honoured in honouring.

In looking to the future, it is, however, important to inquire, not how our [illegible] history will then be regarded, but rather how the Society will be able to maintain its reputation and its usefulness in the new conditions of geographical knowledge. It is true that the South Pole is as yet unc[illegible]tured, that the map of Arabia is still largely composed of great blank spaces, and that the bend of the Brahmaputra is drawn by guesswork in our atlases. But all these problems will, it is probable, be solved before long, and where then will be the field in which the explorer may hope to win renown by robbing the unknown of its romance? We must sooner or later face the fact that the work by which this Society has become best known in the past represents an almost finished chapter in geographical history, and we should sometimes, in preparation for the future, ask ourselves what ought to be our *rôle* when the last leaf in that chapter has actually been turned.

When endeavouring thus to take time by the forelock, we should perhaps in the first place inquire more precisely as to the nature of the change which is now taking place, and as to how soon it is likely to be accomplished. Systematic surveys are, we know, being pressed forward in many parts of the world, of which until recently the maps were produced mainly by the efforts of enthusiastic amateurs, whilst now they are turned out with almost machine-like regularity and precision by Government officials. As to the British Empire, the annual reports of the Colonial Survey Committee show how rapid has been the advance in this direction, and what satisfactory progress has been made; though in certain localities, the authorities, in spite of past experience, seem disposed to linger on in a state of comparative topographical ignorance. Outside the British Empire similar changes are taking place, though less rapidly, with the result that when the international map of the world on the scale of 1 : 1,000,000 is completed, as it will be before many years have passed, a large proportion of it will be based on surveys sufficiently accurate to ensure the work holding good for many a century to come, except for the rise of new towns and the alteration in political boundaries. But in spite of all this progress there are likely to remain vast tracts of land, mapped in a fashion no doubt, but with the details inaccurate and incomplete, where for at least half a century or more from this date the independent traveller will find ample opportunities of adding to the

knowledge of the Earth we live in. Indeed, for some years to come large areas are likely to exist our knowledge of which can only be increased at the risk of the traveller's life. But although the available topographical information concerning many regions will for long remain very imperfect, yet it is inevitable that the day will come when the whole world will be mapped with fair accuracy, and to that condition of things this Society will have to adapt itself.

Nearly all great changes, however, take place gradually, the process of evolution being as a rule an advance made by a great number of small steps; and no sudden geographical revolution need be feared. To move with the times ought not to be very difficult, therefore, and to do so it is mainly necessary to look to the immediate future, or to take "short views of things," to use the words of that wise man, Sydney Smith. If this policy be steadily pursued, there need be no cause for alarm for many years to come, at all events; for, as already suggested, plenty of topographical work yet remains to be done. We ought no doubt, in view of the changing conditions, to direct our efforts with more persistence than heretofore in the direction of encouraging travellers to make systematic and detailed examinations of comparatively small areas, and not merely to cover long distances with the result of doing little more than confirm the impressions of previous explorers. Their surveys should be as good as is possible in the circumstances, and the information they collect should be extensive, varied, systematic, and recorded with reference to the needs of the students of science and history, as well as of the man of commerce. In short, the traveller of the future ought to be a trained topographer, or to have thoroughly prepared himself in advance for some definite class of investigation, if he wishes to win our praises.

If, however, we do pass on to consider the difficulties with which this Society is likely to be faced in the more distant future, it may be some consolation to us to realize that they are not likely to be in any way peculiar to our special branch of learning. In all directions vast piles of facts are being amassed and theories are being founded on them in great profusion, with the inevitable result that every student has now a far more difficult task than heretofore in preparing himself for the work of exploration in the unsurveyed regions of his branch of science. Merely to discover what has already been accomplished in the attempt to solve any one of the still innumerable unsolved problems of science is always a work of considerable labour, whilst even now ignorance of the work done by others constantly involves a useless and even heartbreaking waste of time and energy in toil which eventually proves to be useless because the ground had already been traversed. In many directions what is now most needed is not the gathering of more crops, but rather the tedious task of systematizing, collating, and indexing what is already in hand. No one can now obtain anything like a complete and detailed knowledge of more than one small field in the empire of science, and to form new generalizations

of wide import must become more and more difficult as time goes on, because the man of science must rest his theories more and more on foundations built for him by other workers. Generalization, in short, will in future be in danger of being swamped in the vast ocean of accumulated fact. And the more closely this army of workers in detail succeed in covering the ground, and the more completely their foundations are built over with a superstructure of theory, the less will become the probability of any of those great leaps in advance which in the past have done so much by their dramatic suddenness to arouse the interest of the unscientific world. The impediments to further progress, which result from the amount of the work already accomplished, will be more felt as time goes on, and it is but natural that geography, which is one of the oldest of all the branches of learning, should encounter such troubles at an earlier date than some of her neighbours. We should be proud of what has been done in the past, and should not complain that we are amongst the first to have thrown on us the duty of helping to show how the difficulties, due to the accumulations of the past, can best be dealt with.

Besides the difficulties due to the ever-increasing mass of detailed information waiting to be digested, there is, in the case of geographical societies, the difficulty of deciding which facts and theories ought to be considered as coming within and which as coming without their spheres of activities. Many attempts have no doubt been made by our Presidents and others to mark out the boundaries of our province by defining the word "geography"; but the effect of these pronouncements does not appear to have been very marked. It is indeed questionable whether as much is not lost as gained by rigid definitions; for the exertions of students on novel lines of advance are on the whole quite as likely thus to be restricted as to be stimulated. Words should always be regarded as being our servants and not our masters, and it is quite possible to devote too much time to a discussion of their meaning, because the intellect is apt to be dulled by dwelling on the name of the thing under consideration rather than on the thing itself. Obviously every field of inquiry, which is not already being sufficiently laboured, should be supplied with additional cultivators, and only the most general indications will as a rule be necessary to prevent the Society from straying too far out of bounds.

It is no doubt desirable to ensure a suitable distribution of the work which ought to be done amongst the different classes of workers, and also to avoid an undue dissipation of energy by the endeavour to cover too much ground by any one group; and, in order to ensure these results, perhaps a sufficient guide may in our case be obtained by considering what meaning may suitably be assigned to the word "geography" in a national elementary system of education. If, in addition to all necessary technical training, the young in our national schools are taught reading—that is, reading with intelligence—writing, arithmetic, and the elements of history, it will generally be found that their mental capacity will place

rigid limitations on all further additions to the curriculum. But some general knowledge of the world we live in ought certainly to be imparted, and if maps are made the basis for such a course of instruction, and if many of those facts of wide general interest which can thus be brought into relationship with each other, to whatever branch of science they may strictly speaking be said to belong, are included in the course, an excellent system of mental training will be provided, to which the term "geography" may conveniently be applied. In the education of the young it is of primary importance to endeavour to arouse the interest of the child; and in such a course of elementary geography especial prominence should be given to the human aspects of all the questions dealt with. And if we here find a meaning which can conveniently be attached to the word "geography" in the comparatively lowly sphere of juvenile education, is it not possible that we may thus at the same time obtain a sufficient indication of the limits within which the main efforts of geographical societies should be confined? In short our aim should be, it is suggested, with the aid of maps to correlate and popularize all knowledge which can thus conveniently be harmonized, laying especial stress on all matters of direct importance to the human race. There are obviously certain branches of learning which are clearly within our dominion, such as geodesy, surveying, topography, and cartography, and to these especial attention should be paid. But as to the territories belonging to the other sciences, it would be well if we make it clear that we have no wish to annex them, our only object being as it were to trade with them in order to utilize the goods they produce and to make them more widely known and appreciated.

If this general idea of the sphere of influence of the Society be accepted, the objects which ought to be held in view in the future in order to meet the difficulties due to the changing conditions of geographical knowledge become sufficiently clear. As regards internal administration, the aim must be to make the Society's house a place where accurate information can readily be obtained concerning all countries, including our own, the information thus supplied being all that could be described as geographical within the most elastic meaning of the word. The acquisition of suitable maps and books should, indeed, in future only be limited by financial necessity, whilst the collection of geographical photographs should be well maintained. No pains should be spared to make our systems of indexes as perfect as possible, a subject to which as a fact considerable attention has recently been paid; and with such aids the staff should be in a position to give every assistance to all students wishing to utilize the vast stores of information which the premises should contain. In short, we shall want more maps, more books, more photographs, and a more convenient house to hold both them and the steadily accumulating objects of interest which we own; and if the Society continues to grow in usefulness on the lines suggested, we must look forward to the possibility of a material increase being needed in the number of the staff. Moreover, our means of

keeping touch with foreign countries should be considered from time to time, to see if they are not capable of improvement. For example, as a single possible suggestion, might it not be worth considering whether British consuls, whilst actually serving abroad, should not be allowed to join our ranks with some special advantages as regards fees? Then again, partly with the same object of facilitating the supply of information to our Fellows, partly with the view of making our collections more generally useful, and partly in order to disarm the criticism made against us of wishing to poach in the preserves of other sciences, it might perhaps be well to allow the Fellows of certain other learned societies to use our libraries with the same freedom with which they can now consult the maps in our map room. These points are, however, merely mentioned to show that there are many possibilities of further advance with the object of making it more certain that our Fellows will either receive an answer to every reasonable inquiry, or be placed on the right road to obtain the desired information.

With reference to the external work of the Society, enough has perhaps already been said in order to indicate the directions in which we should endeavour to move as regards encouraging the progress of geographical science. As to the work of exploration and investigation for which we are not directly responsible, this should as heretofore continue to receive our warmest encouragement and our help when possible. And as to the award of medals, which has undoubtedly had such a stimulating effect in the past, it is perhaps worth noting that the task of selecting the recipients is likely to increase in difficulty as the opportunities for startling achievements become less frequent. The geographical work of our descendants is likely, as far as we can now see, to be more often noteworthy for thoroughness than for brilliancy; and thoroughness, it may be hoped, will never be a rare quality, amongst our fellow-countrymen at all events. No alarm, therefore, should be felt if some considerable changes in the method of making our awards should be made in the course of the next few years. It will only be one of the many symptoms of the wide changes taking place in the whole field of science; changes which necessitate our efforts being constantly directed towards ensuring that the work done in the geographical world is increasingly systematic, scientific, and thorough, as well as more and more calculated to be advantageous to mankind.

One other function which this Society may always usefully perform, and one which has thus far been too much neglected, may perhaps here be mentioned. Science is cosmopolitan, and certainly the records of this Society's proceedings during recent years, where the names of Sven Hedin, Peary, Charcôt, and many other distinguished foreign explorers so prominently appear, prove that this aspect of our duties is not now being overlooked. It is not, however, as it seems to me, in the least inconsistent with a belief in our world-wide obligations to hold that the work done by our fellow-countrymen has an especial claim on our attention, and that one

of the aims of a national geographical society should be to keep alive the knowledge of the great deeds of British explorers in the past. Is it not probable that the history of Australia and New Zealand would have taken a very different turn if the work actually done by Captain Cook had been forestalled by some explorer owing nothing to these isles? And yet to that great man no fitting monument has yet been erected. As to Africa, its map should have the names of our fellow-countrymen written all over it if intended to indicate the historical development of that continent—a development due in large measure to British exploration, the history of which we should never allow to die. In the case of thousands of adventurers who set forth to America and elsewhere from these islands in times gone by, and to whose exertions is largely due the fact that English is now the most widely known language on the face of the Earth, and that these islands hold in relation to their size an absolutely unique place in the history of the world, it is true that of these men we do not even know their names, though the effect of their exertions yet surrounds us on every side. It is to be hoped, therefore, that there will always exist in this land a body of men banded together with the object, amongst others, of making more widely known what was done by British explorers in the past, and of honouring the heroic spirit of these unnamed thousands which drove them forth to face untold dangers, and thus to help to build that Empire of which we are so proud.

And now the time has come for me to hand over my duties to my successor, and in doing so two thoughts are especially prominent in my mind. In the first place, a deep sense of pride that the Fellows of this Society should have entrusted this honourable office to my keeping for three years will remain with me as long as I live. But at this moment even more vividly impressed on my mind than that is the sentiment of gratitude which I feel to the officials at Savile Row, who by their constant attention have made the work of the Society almost comparable to the running of an automatic machine, needing, as a rule, no guiding hand, and whose help whenever called for has been so readily given as to have made it almost a pleasure to have asked for it. Naturally the President is brought most closely in touch with the Secretary; and as to Dr. Keltie, my sense of obligation to him is too strong here to be suitably translated into words. As to Mr. Heawood and Mr. Reeves, our Librarian and Map Curator, I am on this occasion particularly anxious to allude to their work, because the steady and thorough way in which it has always been performed has made it appear like a spontaneous growth, with the consequence that it has been apt to escape the praise it so well deserves. Indeed, a keen sense of gratitude will ever remain with me, not only to these leading officials, but to all in Savile Row who, without exception, by the way in which they have performed their duties, have helped to make my presidency a period of my life to which I shall always look back with the greatest satisfaction.

THE FOUNDATION AND DEVELOPMENT OF BRITISH GUIANA.*

By J. A. J. de VILLIERS, Superintendent of the Map Room, British Museum, Hon. Secretary of the Hakluyt Society.

My task is to give in one hour a sketch, based upon voluminous documents still inaccessible to the general public, of the foundation, development, and settlement of that portion of British Guiana which owes its rise to Laurens Storm van 's Gravesande—I mean, of course, the colonies of Essequibo and Demerara; incidentally, a brief biography of that remarkable but utterly forgotten man; finally, a *résumé* of the work performed by Robert Schomburgk for this Society and for England—work which followed the lines laid down by Storm van 's Gravesande, and which was taken up and completed during the last thirty years by Everard im Thurn and others.

This theme is developed in the book very recently issued in two volumes of the Hakluyt Society, wherein I had the pleasure of collaborating with Mr. Charles Alexander Harris, Chief Clerk of the Colonial Office, without whose valuable co-operation and comprehensive grasp of the subject that work could never have been satisfactorily written. When I remind my hearers that Lord Alverstone's speech on the boundaries of this colony before an Arbitration Tribunal in 1899 occupied thirteen full days, they will understand how difficult has been the task of compression.

British Guiana, our sole possession on the Spanish main, is divided into the three great counties of Essequibo, Demerara, and Berbice, all colonies founded by the Dutch. The earliest accounts of the country, more or less veracious, were written by Raleigh, Keymis, and Masham in 1596, by Cabeliau in 1599, by Leigh in 1604, and by Harcourt in 1613. The first Dutch historian who dealt with Guiana was de Laet in 1625, drawing for his facts upon the pioneers just mentioned and largely upon Spanish sources. He was followed nearly a century and a half later by Hartsinck in 1770; then Dalton in 1854, Netscher in 1888, and finally Rodway in 1891 dealt with the portion which is now British.

Even in Netscher's work, reliable and comprehensive as it is, gaps occur which are admitted and deplored by the historian himself. But these gaps have now been to a large extent filled up, for the origin and development of British Guiana has recently been the object of much deep research, necessitated by the perennial boundary controversies of the settlements on that coast. After extending over quite a century and a half, the diplomatic struggle was ended only within the last decade by arbitration between England on the one side and Venezuela and Brazil on the other.

The name Essequibo, which appears in several forms in the earliest writings—the most correct being probably Esscapi—is first connected

* Royal Geographical Society, May 8, 1911. Map, p. 112.

with Dutch enterprise in Cabeliau's 'Account of the Voyage to America' performed in 1597 and 1598. Cabeliau, who was supercargo of this voyage, mentions "Essekebe" as one of the rivers lying between the Corentin and the Orinoco which were passed without investigation; but his report produced a petition to the States-General for permission to colonize Guiana, and it seems certain that private enterprise even ran ahead of the official policy which was embodied in the charter granted to the Dutch West India Company in 1621.

The precise date of the first settlement of Essequibo is possibly one of those problems which will never be solved. The only definite statement extant is that contained in a manuscript penned by Major John Scott, geographer to Charles II., in or about 1669, which attributes the foundation to one Gromweagle (really Groenewegen), who, in or soon after 1616, is stated to have erected a fort "on a small island, 30 leagues up the river Isseekeeb." This is clearly Fort Kijkoveral, which for nearly a century was the centre of the Dutch colony. Scott's veracity in this and in other matters has not been unimpeached, and I have but recently stumbled across a highly imaginative pedigree of his written by himself; yet this statement concerning the formation of the Essequibo settlement receives a measure of confirmation from a French manuscript of 1624, which indicates that there was at that time a settlement in Essequibo of some years' standing. This interesting journal of the "Voyage faict par les Pères de Familles" contains a precise account of the entrance to the river "Eziquebe" and a sketch-map of the anchorage close to the site of Fort Kijkoveral which leaves no doubt as to accurate knowledge of that position; it also contains observations which imply a previous acquaintance with the district and an already existing trade.

Not later than 1625, at any rate, the settlement of Essequibo had begun to be exploited by the Dutch West India Company, and we can thenceforward follow its internal development by authentic and well-defined references to its trade and its officers.

One word as to the value and scope of this trade. The trade in the interior was of two kinds—trade by officials of the Company; trade by private individuals with legally protected rights. This dual and competitive system of trade carried on with the natives naturally led to exploration and extended influence. In Guiana, as often elsewhere, the private traders went in advance of the flag; this was borne by the slower-moving company, often, as the documents show, by the natives themselves. There is evidence, beyond all doubt, that within a few years after they had settled at Fort Kijkoveral, the Dutch had penetrated, by way of the Essequibo and connecting waterways, to the region bordering on the Amazon, and that a great portion of the district which lay between the Rupununi and the Amazon was covered by their systematic trade. We see, in fact, not only from Dutch, but also from reliable Spanish and Portuguese sources, Dutch trade flowing as a strong

under-current in the history and development of the colony from 1625 onwards. It were impossible for me to give its details to-night. Of the highest interest and deepest import with regard to Dutch and British claims in the hinterland of Guiana, these details (that often take even a romantic turn) deserve treatment in a separate paper, that would have to deal also with the subjection by the Dutch, through the influence of such trade, of various powerful Carib tribes.

But I must now go on with the main theme before us. In 1704 was born Laurens Storm van 's Gravesande, the man under whose long administration the colony, as we know it, was organized, and the beginning of the eighteenth century marks the furthest extension of the sphere of Dutch influence which had its base in Essequibo. No subsequent efforts of the Dutch, no recent explorations of the British, have added to the area which was in a manner controlled by the then Commander, Samuel Beekman. Storm's part was to realize, to consolidate, and to give definition to the idea of territorial ownership. It was reserved to the British in the nineteenth century to give greater precision to this dominion, and finally to determine the boundaries of the colony. But the vague limits which may be assigned to the Essequibo settlement in 1700 were only in definition inferior to the boundary of the present day; in some directions they went far beyond it.

At that date the colony of Essequibo was centred round Fort Kijkoveral, which stood on an island some miles above the point where the Essequibo is joined by the united Massaruni and Cuyuni; on the main banks of the rivers, at the junctions, were some plantations of the Company's, and some others belonging to private individuals; cultivation was rather slowly spreading down the lower banks of the Essequibo towards the islands which stud its mouth. To the eastward there was practically no settlement nearer than Berbice, which was formed in 1628, and the Demerara river was unopened. Westward the sphere of the Dutch extended along the coast to the mouth of the Orinoco, and in the interior also to the neighbourhood of that river; indeed, it may be said to have permeated the whole country between the Essequibo and the Orinoco. Southward up the main river of Essequibo there was at that time no station, but the Company's traders were quite accustomed to journey up as far as the mouth of the Rupununi, and also to proceed across country to a higher point on this river, along which they made their way to the savannahs which lie between Guiana and the Amazon, and probably, as I have already indicated, even further to the south.

Among the records that came into the possession of Great Britain when Essequibo and Demerara were transferred to her in 1814, were the reports sent home by the higher officials of the Dutch West India Company; and of chiefest interest in those reports is the series penned by Storm van 's Gravesande, a governor so utterly forgotten even in his own

country in the nineteenth century that General Netscher, in his 'History of the Colonies of Essequibo, Demerara, and Berbice,' speaks of him as one of those meritorious Netherlanders "whose names are but little or not at all known, and who nevertheless deserve to be dragged from oblivion."

The whole of Storm's despatches, covering a period of thirty-four years—from 1738 to 1772—would fill twenty-one volumes of three hundred octavo pages each. In its recent issue of a comparatively small selection from those letters, the Hakluyt Society had no intention to have the history of the colony written or re-written. The excellent and exhaustive work by Netscher just mentioned cannot easily be surpassed. But Storm's letters were unknown to Netscher, and Storm's life covers a very important if comparatively brief period in the colony's history, and even though it cannot be claimed that there was, *de jure*, any extension of the boundaries of the vast country entrusted to his jurisdiction, yet under Storm Essequibo reached the apex of its prosperity whilst subject to Dutch rule, under him Demerara was actually commenced. By his untiring energy the desert places were peopled, by his tactical ingenuity the native tribes were subjected, by his patriotic zeal his envious and bellicose neighbours were kept off. If not *de jure*, there was certainly extension *de facto*.

Born at 's Hertogenbosch on October 12, 1704, Laurens Storm van 's Gravesande entered the army in his seventeenth year, a somewhat hot-tempered youth, perhaps, for in his despatches he frequently mentions his habitual outspokenness, and late in life speaks of a quarrel he had in 1730 with his stepmother's father, the Burgomaster of Utrecht, which cost him his promotion. In spite of this it was the opinion of the Prince of Orange that he would have risen to the rank of general had he not elected to serve the West India Company in their colony of Essequibo as secretary and bookkeeper, for which office he took the oath in Middelburg in October, 1737.

Prizing and pocketing his colonel's hearty congratulations upon his advancement, the young soldier sets out for his new home—for, although he doffed the soldier's coat, Storm was before all and throughout all a soldier. The very first subject he deals with in his first letter home is neither sugar nor shipping—the two that interested the directors most, and were to give him so much trouble later—but the condition of the militia. Without an efficient force it was impossible even to keep the slaves in awe, let alone to repel Spanish encroachments, and year after year we find Storm urging upon the directors with wearisome reiteration the necessity of sending out reinforcements of honest, well-trained men. In addition to what was within the ordinary sphere of his work, Storm organized trading and mining expeditions that were to have far-reaching consequences for the colony, and had already in mind (for he had personally taken the soundings of the river) a new settlement in

Demerara. So much disinterested industry could not long remain unrewarded.

Commander Gelskerke died in July, 1742, and the councillors, appreciating the extraordinary zeal and activity displayed by the secretary, provisionally appointed him commander whilst awaiting orders from home; the appointment was made a definite one in Zeeland on April 13, 1743.

From that time onwards Storm's despatches teem with interest; but it is not my purpose to do more than summarize broadly Storm's main policy in those matters which affected the development of the colony.

It may be said that the territorial consolidation of Essequibo constitutes the chief feature of Storm's governorship; and in three separate ways its story presents itself in his despatches:—first, in the definite steps taken to consolidate the possessions of the Dutch by a deliberate and thoughtful policy of *development* and *exploration;* secondly, in the policy pursued towards the various Indian tribes which Storm found in possession of the interior and coast; thirdly—and perhaps this is the most interesting of all—in the discussion as to the frontiers, and Storm's stout defence of the rights of the Netherlands against Spain.

The most interesting feature in the *development* of the colony under Storm was the rise of the province of Demerara. At the beginning of his administration Demerara was a mere trading area covered by the Company's traders, guarded by two trading posts, and only casually supervised from the fort. At his death it was the predominant partner in the colony.

It has not been hitherto demonstrated how much Demerara owed to Storm and his encouragement of the English settlers. With a less wise and independent man it might easily have been crushed in its infancy, or at least have been kept for many years longer under the jealous control of Essequibo. In this, as in many other matters, Storm laid the foundation of the present colony of British Guiana.

In the first muster-roll extant, dated 1691, two outlying stations are mentioned—one in Demerara, one in Pomeroon. In 1746 the Demerara was opened to general trade; its post was abolished as no longer necessary, since settlement along the river proceeded with remarkable rapidity, and within some five or six years was outstripping that of Essequibo.

In a despatch of December, 1748, Storm speaks of a crop of sugar in Demerara beyond all expectations, and expresses his hope that there would be a flourishing colony later on. He recommends the directors to send out special families as settlers, and indicates that the time has come when it is necessary to appoint somebody to administer the affairs of the new district. A couple of years later, in 1750, the last representation

was duly accepted by the directors, who appointed Storm's own son to be the first commander of Demerara. To that part of our colony we will come back a little later.

Of Storm's masterly policy of *exploration* I will give you but one instance, though a very important one, for it finds a place in the historical geography of the world. Only a year after Storm's arrival in the colony, one Nicholas Horstman, a German surgeon in the employ of the West India Company, was sent up the Essequibo to find the passage to the Amazon river—I think I may venture to say, to re-discover that passage—to trade with the natives *en route*, and *en passant* to discover, if possible, the famous but mythical city of El Dorado, situated on the equally mythical Lake Parima—a lake that was portrayed as of enormous extent on all the maps of South America till then published.

Crossing the watershed between the Essequibo and the Amazon, Horstman found the true origin of the fable of the Golden Lake, just as Robert Schomburgk re-discovered it one hundred years later. It was only a small lake, Lake Amucu, which occasionally overflowed its shores and formed a great swamp. On reaching the Rio Negro, Horstman turned traitor and remained with the Portuguese. There he met La Condamine, and handed that traveller a copy of the map of the country he had traversed. That map, correct in its main features, was the first intimation to geographers of the true configuration of the land between the Essequibo and the Amazon. La Condamine handed it to d'Anville, a famous map-maker of the eighteenth century, and by him it was made the basis of a generally correct delineation of that part of the country in the first great map of South America, published in 1748. There, as you perceive, we find only the small Lake Amucu. So persistently, however, do we, even in the most exact of sciences, revert to ancient myths and beliefs, that d'Anville, twelve years later, reintroduces, in his map of 1760, the dear old Lake Parima that Raleigh thought was there; and Hartsinck, though he should have known better, follows him as late as 1770. Humboldt often refers to Horstman's map in his 'Voyage aux régions équinoxiales.' It was lost for about a century, and was finally unearthed in the Bibliothèque Nationale in Paris by Mr. Charles Alexander Harris some ten years ago.

Horstman's expedition, abortive as it seemed at the time, had eventually that effect which Storm, undoubtedly its promoter, could have desired. It was the visible sign of an intention to take possession of the inland regions to the southward—the "uplands" of Guiana. It became in years long afterwards a leading proof of Dutch efforts in the interior around the sources of the Rupununi and Takutu—efforts that had already been made long years before by Dutch traders between the Essequibo and the Amazon.

We now take Storm's *native* policy, which was a broad and enlightened one; so far as it was actuated by self-interest, it certainly recognized that self-interest was bound up in the general interest of the Indian tribes. It was an advanced policy for that age. In 1750, when Storm was on leave in Europe, he made a special report to the directors of the West India Company, which contains a remarkably wise statement of his general Indian policy. While he treats the Indians as the natural friends and allies of the Dutch, he lays great stress on the folly of placing arms of precision in the hands of natives; his statements and arguments on this point are precisely those which have been familiar within the last half-century to British administrators in Africa. Nor did he overlook the danger that the competition of neighbouring colonies might frustrate his broader view, just as Great Britain has in West Africa had to face the reluctance of French or German merchants to adopt the policy which all in theory recommended.

Summed up broadly, Storm's general idea on this subject was embodied in a brief sentence of a despatch of 1762: "So long as we have the good fortune to stand well with the Indians (and I shall always try to remain so) and keep them under our protection, so long, I say, we need have no fear."

The result of the policy just described was shown at the time of a dangerous revolt of the negro slaves in Berbice. The actual force of this revolt was confined to a colony for which Storm was in no sense responsible. But danger to Berbice bred danger to Demerara and Essequibo; so Storm disposed of the whole of his force to help Berbice in its extremity. He called upon the Indians from every part of the colony. He set Caribs and Arawaks in motion throughout Essequibo—from the Rupununi and the Cuyuni to the Corentin and the Abari; and in large measure to this successful use of the Indians we may attribute the safety of the sister colony.

The results of Storm's Indian policy remained down to our own times. The Indians claimed from the British in the next century the privileges and alliance which they had enjoyed under the Dutch; and the position was readily accepted.

When all is said and done, it is the *diplomatic* side of Storm's administration which is the most interesting and perhaps the most important. Storm's investigation of the boundaries of the colony under his command, and his maintenance of the rights of the Dutch company against the aggressions of the Spaniards were at once the foundation- and the coping-stone of his efforts to consolidate that colony as a geographical unit. It is impossible to exaggerate the importance which his despatches had in the recent boundary dispute between British Guiana and Venezuela. Just as his careful trade administration and his Indian policy fixed the geographical extension of Guiana, so his vigorous denunciation of Spanish

claims and his insistence on the responsibility of the Dutch company to their furthest limits furnish the legal basis upon which the British found their title to their one South American colony. Again, I will give you but a single instance.

In September, 1758, Storm reports to the directors at home that the Cuyuni post had been raided by the Spaniards. Nearly all the Caribs living on the river had come downstream and reported that Spaniards from Orinoco, estimated at about one hundred, had made a successful raid upon the post, carried off the post-holder and his assistant, laid waste the post and all around it, and threatened to come down and serve the whole colony in the same way. Storm took the whole affair with rare good sense. With very little delay he addressed a despatch in French to the commandant in Orinoco, protesting against the action which had just been reported to him, and dealing in terms of dignified remonstrance with the violation of territory, which now bid fair to disturb the peaceful relations between Spain and the Netherlands. He got scant satisfaction. Haughtily and vaguely the Spaniards claimed that the river Cuyuni was in Spanish territory, and that the Dutch post-holder was carrying on a slave trade within the Spanish dominions; the restitution of the prisoners was declined. In the name of the States-General, his sovereigns, Storm persisted in his remonstrance, and for the second time demanded the liberation of the prisoners and suitable satisfaction for the violation and insult done to the territory he administered. He warned the Spaniard at the same time that the whole correspondence was being sent to Europe, and that he had every confidence that the Government in Madrid would, without hesitation, give complete satisfaction.

The resolutions of the Dutch West India Company read very lame by the side of Storm's vigorous protests. But it is probable that he had backed up his official despatch by one of his private communications to the advisers of the Prince of Orange, and in August, 1759, a formal remonstrance by the States-General was on its way to the Court of Spain. A second remonstrance in August, 1769, after another raid, may be counted as the crown of Storm's diplomatic efforts. It was received with courtesy and attention by the Spanish, and though it never had a final and direct answer, even after fifteen years of consideration, it practically stopped overt acts of aggression.

The document is interesting as embodying a formal claim to the colony as it then stood, namely, that the Dutch had "from time almost immemorial been in possession not only of the river Essequibo and of several rivers and creeks flowing into the sea along the coast, but also of all branches and streams which fall into the said river Essequibo, and more particularly of the most northerly arm of the said river called the Cuyuni." Much the same assertion was contained in the earlier remonstrance of 1759, and may be looked upon as the definite claim in the face of the world to the boundaries of the territory to which Storm had devoted his life.

We must now go back a little to more internal affairs of the colony.

In March, 1749, Storm deemed it very desirable to give his masters a full verbal report of the condition of affairs, and therefore applied for leave to visit Europe. The leave was granted, but the visit was ill-advised. Storm's absence of two years from a colony seething with godlessness and disloyalty proved too great a strain for the maintenance of what slender authority he possessed; the commander, well received at home by the ruler, Prince William IV., and other magnates, was raised to the dignity of Director-General, and his eldest son was given the commandership of the newly founded settlement of Demerara; the Company, however, seized the opportunity of insisting upon what is referred to as their "great reform," a system of false economy first mooted in 1744, and Storm returned to the colony to find his prestige greatly impaired. Spoors, the secretary, had (probably as a complimentary prolongation of his provisional administration during Storm's absence) been given official direction, *conjunctim* with the Director-General, over the Company's plantations; this annoyed Storm, for if it lessened his responsibility, it must also frequently have led to a conflict of opinion. The planters, moreover, regarded the head of the colony (more than ever since his visit home) as the mouthpiece of a Company which neglected their interests and sought only its own profit. Storm had henceforth a treble battle to fight—discontent within, invasion ever imminent (or what was nearly as bad, a fear of it), and neglect, born of dissatisfaction, on the part of the home authorities.

Already in 1744 Storm had written home, "The non-supply of slaves is another matter that greatly retards the rapid growth of the colony. . . . If no remedy be found it will always remain an immovable obstacle in the way of all progress."

But, as he himself says late in life, "Mine was the fate of Cassandra." And as with slaves, so with supplies. Appeal follows upon appeal, but later references prove that all were equally without results so far as regards the regular upkeep of shipments.

Consolation for and distraction from his troubles Storm found in naught so much as in the pleasure he derived from the rise of Demerara. And that pleasure came at a very opportune moment. Only a few months after his return in 1752, he writes most optimistically of the progress being made by the young colony commenced in 1746, mentioning both the activity of one Gedney Clarke, of Barbados, and the coming of other planters from other isles. The next year he exults in the number of allotments made for plantations, and relates that the inhabitants, "of whom by far the greater number consisted of English or of those understanding the English language," had begged for permission to hold divine service in their mother tongue, which "most laudable request" he "immediately granted."

In the very next letter to that in which he announced Clarke's enterprise, Storm, introducing him, as it were, to his directors, speaks of him as "a man of judgment and of large means, having the welfare of this colony really at heart." And Clarke, by his subsequent conduct, fully justified Storm's opinion of him on both these points, for it was by his prompt aid that the colony was, a decade later, saved from ruin.

Whether Storm's friendly relations with the Clarkes—father and son—were dictated, in their inception, by policy, or were simply the outcome of reciprocated esteem, it is difficult to determine, but the friendship was of far-reaching consequences for the colony. It warded off, in 1764, a calamity similar to that which had just befallen Berbice, and at a moment when the means at Storm's disposal were too slender to cope with it. When the alarm came, Storm was sufficiently diplomatic not to apply in the first instance for direct aid from the English, simply informing Clarke, who had large estates in Demerara, of the danger that colony was in. When the danger became more imminent, and he had resolved, "after long deliberation and reflection," to ask the Governor of Barbados, in the name of the States-General, for the aid of two hundred men, "should the state of affairs after due examination require it," Clarke's activity rendered it unnecessary for Storm to carry out his resolve. Nevertheless, in spite of his subsequent declaration (in reply to the Company's inquiry) that "direct assistance I never asked for, although I was on the point of doing so once," Storm handsomely admits, and more than once, that the succour sent by the English "was, after God, the salvation of Demerara."

The last and shortest of the three periods into which Storm's colonial career was carved by the incidence of events was not, as befitted the evening of a life spent in duty, one of peace and calm, but in direct antithesis to what the man deserved and desired—a time of ceaseless troubles for which he was not responsible and over which he had but little control.

In June, 1764, he writes, "Mr. Spoors [the secretary] has almost lost his sight. . . . This grievous occurrence . . . brings such a whirl of matters upon me that I see no getting through them."

And in August we have the following pathetic announcement: "On July 20 it pleased the Almighty to take my son, Gerard Johan, from this temporal to His Eternal Kingdom, at the age of twenty-four; of my six sons I have therefore none left but the youngest, who has gone to Europe in the country's warship *Zephyr*. Painful occurrences in my old age, and following, too, so closely upon each other; but we have to submit to the will of the Most High—who can ward off His hand or say to Him, 'What doest Thou?'"

Yet so untiring was the energy of the man that by the same vessel which carried the despatch announcing his son's death he sent home "a

short treatise concerning plantership"—translated "during odd moments of leisure"—and a long and important report upon the Company's trading posts. All this time Storm's duties were ever increasing, and no thought was there on his part of shirking them, though his faculties were failing him fast. It is, then, the more cruel irony that the men so ironically misnamed directors, who for a long series of years had systematically starved the colony in rations, slaves, and means of defence, who regarded it as politic to keep in office, much against his will, their faithful but decrepit servant, should, but a few months before releasing him from a service of thirty-five years, accuse him of "bad and unjustifiable management," suspect him of a lack of "honesty, attention, and economy"!

Themselves importing no slaves, they rail against the illicit but unavoidable importation by the English; sending insufficient rations, they complain that their slaves are kept short of them; supplying not even the most rudimentary requisites for the plantations, they express dissatisfaction with the yields. Children playing a game would act more logically than did they.

Early in August, 1772, Storm foreshadows trouble, hints at its cause, and explains his humane and statesmanlike efforts to stem it. But the storm burst, and once more the colony was, by a serious slave rising, brought to "the brink of total ruin."

As throughout, so was Storm a soldier to the end. His despatches of August and September, 1772 (the last he indited), are all that such documents at such a time should be—exactly explicative of events and of measures taken, commendatory of those who had distinguished themselves in valour, and advisory respecting future means of defence. His successor, George Hendrik Trotz, arrived at Fort Zeelandia on November 27, 1772, and Storm's career was over, *salvis honoribus*, as he had so ardently wished. He immediately retired to his plantation in Demerara, where he died August 14, 1775, in his seventy-first year. Storm passed quietly into oblivion whilst strangers enjoyed the fruits, and for a long time the fame of his lifelong work; hence the words he had himself so often applied to his efforts on behalf of the colony form his most fitting epitaph—

Hos ego versiculos feci, tulit alter honores.

Storm's successor carried on the main traditions of his predecessor's policy, particularly as regards the natives; from this time a policy of organizing Indians under Dutch control became a permanent one. Staves of office, first suggested by the Court of Policy in 1774 and apparently first awarded in 1778, became the ordinary symbol of a chieftainship in alliance with the Dutch, and this definite Indian connection grew to be the mainstay of Dutch administration in the interior. The special relation subsisting between the Indian tribes and the Dutch was almost naturally transferred to the British when, thirty years later,

they finally took over the colony; and it will be found to have formed one of the chief safeguards of the territorial claims which the British have recently made good before the world.

Meanwhile, as Storm himself had foreseen, Demerara was developing far faster than the older settlement; in spite of great increase in the grants of land on the Pomeroon, the centre of gravity was gradually shifting to Demerara. The success of the sugar plantations in the hands of certain pushing English settlers added a special impulse to this tendency.

In 1781 war broke out between the English and the Dutch, and one of the first British successes in the West Indies was the capture of Demerara. This was followed by the fall of Essequibo and Berbice. Between that time and the end of the eighteenth century the three colonies repeatedly changed owners, but in September, 1803, they once more fell to the British, whose hands they never left again, being finally ceded under the Treaty of 1814. In 1831 Berbice was united with Demerara and Essequibo; henceforth they were but three counties or provinces of British Guiana.

We now pass to the most interesting and important series of explorations ever undertaken in the country, and it is noteworthy that they followed very quickly upon the final unification of the old Dutch colonies under one government. Robert Schomburgk was first sent out by the Royal Geographical Society as a result of a resolution taken in 1834 to explore the interior of the colony, this project having in some measure been suggested by Humboldt's journeys, and having, as the *Journal* of the Society records, received the fullest sanction and patronage of His Majesty's ministers. Schomburgk's reports and journals throughout the whole of his explorations form one of the most complete and interesting narratives with which the annals of geography have ever been enriched.

Schomburgk was a man with remarkable capacity for observation. He combined great natural genius as a surveyor with the eye of a botanist and the training of a naturalist. His references to the Indian tribes are full of a sympathetic intelligence which renders him, even at this date, *one* of the best chroniclers of Indian manners and customs.

Leaving Georgetown in September, 1835, he proceeded up the Essequibo, beginning the serious ascent of that river in October. He followed the line of the old Dutch traders, turned to the west up the Rupununi, and halted in November at Annai. From that centre he explored the whole of the Rupununi and the savannahs which surround it, and took the first step towards exploring the Mahu. He also made his way up the Essequibo proper to the great fall which he named after King William IV., and investigated the paths connecting the Essequibo with the upper reaches of the Demerara river. In the following year (1836) his work was the ascent of the Corentin and the Berbice, on the other side of the colony. In 1837–8 Schomburgk carried out the design upon which he was mainly bent, and discovered the sources of the

Essequibo, where he hoisted the British ensign; he also reached the Acarai mountains, on the watershed between the Essequibo and the Amazon. He then proceeded with a journey which took him outside the boundary of the colony, and had results far beyond those of simple exploration. The object of his expedition, as he puts it himself, was, after examination of the Essequibo sources, to connect his journeys from the east with those of Humboldt at Esmeralda, on the upper Orinoco.

The representations which, on his return to England in 1839, Schomburgk made as to the needs of the Indians on the savannahs near the Rupununi, and to their danger from Brazilian raiders, attracted notice in Parliament. The British Government decided that steps must be taken to stop further interference with the natives and violation of territory which was believed to belong to Great Britain. It was therefore decided to send Schomburgk to make a complete exploration of the boundaries of British Guiana, and to mark them provisionally, subject to due notice to neighbouring powers. The announcement of Schomburgk's appointment to the other governments interested brought up at once the whole question of boundary, not only on the side of Brazil, but also on that of Venezuela.

Between April, 1841, and October, 1843, Schomburgk, now accompanied by his brother Richard, covered practically the whole boundary of British Guiana as it stands at the present day. Some temporary excitement in Venezuela was caused by this survey, but the consequent questions with the Venezuelan and Brazilian governments were soon quiescent. Negotiations came to a premature end without any result, and the reports of Schomburgk's surveys with the fine maps he produced lay buried for nearly half a century.

The *colonists* assumed that Schomburgk had pretty well settled boundary questions, and not being troubled with further claims from Venezuela or Brazil, they set themselves to the development of the cultivated districts, where coolie immigration was coming to the aid of the planters and was starting the estates upon a new era of prosperity.

The *Indians* had little cause for anxiety as to their security, especially as it was notorious to them that Schomburgk, who had thoroughly won their confidence, had been marking a boundary, and that he claimed the land within that boundary as British territory. It is well known that the Indians moved inside the Schomburgk line, and so did their best to establish a well-understood frontier within which the jurisdiction of the British Government was admitted to run.

It was therefore not until the last twenty years of the nineteenth century that the boundaries of British Guiana were finally and legally settled. The journeys of the Dutch traders, the efforts of the post-holders under Storm, the explorations and surveys of Schomburgk, work such as that of Sawkins and Barrington Brown (which I have had to pass over through lack of time)—in fact, all attempts to fix

the geography of the colony, found their ultimate result in the decision of two arbitral tribunals. Similarly, the work done by Storm in defence of the rights of the Dutch, the Indian policy initiated by the Dutch and carried out through so many years by the British, and the determination of the British to make good the rights which they inherited from the Dutch —all found their justification in the decision of those two tribunals.

What may be described as the last chapter in the history begins in the late seventies with certain travels and explorations by British officials of the colony, chiefly by two men whose names became inseparably connected with the question of the boundary.

In 1878, Everard im Thurn, then a young man not long from Oxford, obtained leave to spend a holiday in the savannah district in the south of the colony. There he stayed some months amongst the Macusis and the Wapisanas, becoming better acquainted with those Indians than any other European had ever been before him. The book which he published on the subject is a classic, and therein Mr. im Thurn remarks that the line laid down by the Boundary Commission under Schomburgk was accepted in that district by both the British and the Brazilians. In the same year, Michael McTurk, an officer in the service of the colony, was appointed special magistrate and superintendent of Crown Lands and Forests of Essequibo. Possessing the full confidence of the natives, a daring leader capable of taking any risk and of undergoing any privation, McTurk was a man marked for the performance of the exceptional duties assigned to him. He had become, in fact, a sort of official explorer of the colony, and it might be safely stated that in scarcely a single year since 1878 has he failed to add something to the knowledge of Essequibo possessed by the British Government.

Expeditions were made by Mr. McTurk with Mr. Boddam Whetham in 1878, and by Mr. Henry Whitely in 1883, in the forest zones round the Pacaraima mountains with a view to the ascent of Roraima; each had its interest, but the successful undertaking was reserved to Mr. im Thurn and Mr. Harry Perkins in 1884. Up to that year Roraima had been considered inaccessible; im Thurn performed the feat of ascending the great sandstone cliff and exploring the whole of the flat top. Roraima stands at the junction of three states, and technically it belongs to all three—Britain, Venezuela, and Brazil; but in fact it is essentially a British mountain, discovered by the British, ascended by the British, and reported on only by British authorities. This expedition of im Thurn's may be looked upon as the last effort of exploration for its own sake in British Guiana. Later incidents that took place brought the boundary question definitely to the fore, and made it impossible to view any subsequent exploration apart from the question of claim to a particular boundary. One of these incidents was the final declaration in 1886 by the British Government of the Schomburgk line as the definitive boundary

of the colony; another was the decision to organize as the "North-Western district" of the colony the coast region between the Pomeroon and Demerara, where there were already a number of occasional, if irregular, settlements by British subjects. Such decided action by Great Britain led to the suspension of diplomatic relations with Venezuela in the early part of 1887. In the course of that year rumours of gold discoveries along the boundary, combined with the publication of a Venezuelan concession over territory which Great Britain claimed, led the local Government to issue a proclamation which specifically reserved British rights over the most extended boundary which had ever been claimed by the Dutch, *i.e.* the whole basin of the Cuyuni river and its tributaries, including the area occupied by the Spaniards who had been such a thorn in Storm's side.

On December 18, 1895, President Cleveland issued the celebrated message in which he called upon Great Britain to submit the whole question of the boundary to arbitration. Arbitration was not yet then such a familiar word with us as it is to-day, and such a breach of ordinary diplomatic routine took the whole world by storm. For a few days two great kindred nations were on the verge of war; then wiser counsels prevailed, and early in 1896 the British Government gave way. Venezuela placed its case in the hands of American jurists, and each side prepared case, counter-case, and argument, in which the history of three centuries was laid under contribution. After more than two years of this preliminary argument on paper, a Tribunal met in Paris in 1899, and a judgment was given which in effect sustained the whole claim of Great Britain to the Schomburgk line. The only material divergence was at the mouth of the Barima. Here the Tribunal, apparently influenced by the arguments of American counsel on the ground of national safety, decided that the British boundary began at a point some distance eastward from Point Barima, and so gave to Venezuela the mouths of both the Amakuru and the Barima. Thus, by the Award of Paris of 1899, the north-western boundary of the colony was finally settled, and the line accepted by the Tribunal was a line which would have fairly satisfied the claims made by the old Director-General Storm some 140 years before.

Negotiations for an arrangement with Brazil were actively prosecuted as soon as the award in the Venezuelan matter had cleared the ground of that question, and these resulted in a treaty of arbitration signed in November, 1901. By this treaty the two governments agreed to limit their claims by a definite zone, and to submit the question of boundary to the decision of the King of Italy. In the centre of that zone was Pirara on Lake Amucu, the site of the fabulous Lake Parima and El Dorado, and the path of the old Dutch traders first mapped by Horstman. This arbitration was conducted entirely by written case and argument; His Majesty gave his award in June, 1904, and that award may also be claimed as a considerable triumph for Schomburgk's line. The Mahu

and Takutu were made the boundaries of Brazilian territory, and in this way Great Britain preserved both her rights to the savannah country beyond the Rupununi, which had been dominated for 300 years by the Dutch and British, and also her suzerainty over the Wapisana and Macusi Indians, who had for years relied on the protection of the above-named nations.

Thus by the end of 1906, by which date the actual work of delimitation, too, was completed, British Guiana for the first time had its boundaries definitely fixed, and though those boundaries almost certainly did not go so far as Dutch influence at one time went, still they included most of the territory for which Storm van 's Gravesande had always contended, and they justified in a marked degree the line drawn by Robert Schomburgk.

The PRESIDENT (before the paper): Mr. de Villiers, who has kindly consented to read a paper to-night on British Guiana, is very well qualified to deal with all questions connected with that colony, whether geographical or historical. As to geography, I may perhaps mention that he is now in charge of the Map Room of the British Museum; whilst both from the point of view of geography and history he has had exceptional opportunities of studying the affairs of British Guiana. During three years he was employed by the Foreign Office in connection with the Venezuelan arbitration, and at a later date he was for three or four years employed on similar duties with regard to the demarcation of the boundary between Brazil and British Guiana. In the course of these investigations he had to visit Lisbon and the Hague, and to study vast piles of Dutch and Portuguese records. The result of this investigation was, amongst other things, the publication of two volumes published by the Hakluyt Society containing an account of the doings of an early Dutch administrator of the new British colony. The hero of this romance of real life, whose name was Storm van 's Gravesande, was in truth an able and remarkable man, well deserving of Mr. de Villiers' sympathetic appreciation.

Sir CLEMENTS MARKHAM: I will make a few brief observations, and be as short as possible, because we have here present the highest authority on the cartography of Guiana, who will address you in a much more interesting way than I can. We have, I am sure, all enjoyed listening to Mr. de Villiers' interesting paper, and admired the way in which he has brought before us the great administrative ability of a distinguished Dutch statesman, who practically founded the colony of Guiana, who administered it with great skill, who established an admirable system of friendly relations with the Indian tribes, and who, above all, promoted exploration in that country. The name of Horstman, I must acknowledge, is new to me, and I was not aware that D'Anville had obtained the results of his explorations in that unknown region as far as the Rio Negro. I should be tempted to say a good deal more on that region, and to refer to the little we know of it, but there is not time. The inheritance which we received from Storm was a very noble one, and then this Royal Geographical Society stepped in. One of the first expeditions that it promoted was that for the exploration of Guiana by Sir Robert Schomburgk. I am old enough to have been acquainted with Schomburgk, perhaps the only one in this room who was acquainted with him—not, I must allow, when he was exploring Guiana, but years afterwards during his service in

Siam. After we had received from him admirable maps, especially that showing the boundary which Storm would have claimed, there came those demands from Venezuela, backed by the United States, which led to very minute and valuable investigations into the history of the boundary-line. Mr. Harris will remember that I had a good deal to do with that when he was discovering those valuable maps of Schomburgk's, and how the authenticity of the line was disputed. Owing to the American-Venezuelan Commission not being acknowledged by our Government, it fell upon me, for a short time, to correspond with the secretary of the Commission, and thanks to the valuable maps discovered by Mr. Harris, I was able, I think, to make a very good story for this country, and I certainly converted two of the experts upon whom the American Government relied. I only wish Lord Alverstone could have been present to-night to have heard Mr. de Villiers' paper, and to have seen what valuable results have been derived from the investigations necessary for the arbitration. I think we may congratulate both the Hakluyt and the Geographical Societies at having, through the results of these investigations, been furnished by Mr. Harris and Mr. de Villiers with these valuable and most interesting documents and maps.

Mr. C. A. HARRIS: It is very kind of you to ask me to address you this evening, and if my observations may be rather fragmentary you will put it down to a desire to introduce to you one or two of the more interesting points that occur to me as I look back over the past, in which I have been connected with this Guiana question.

Sir Clements Markham has referred to the way in which, in the early days of the trouble with the United States, he was called upon to examine all sorts of maps, and so forth, and I dare say he will remember at that time how every one who had a map, or who ever thought they had had a map of America, came rushing into the Government to offer them their wares, and in that connection I saw much of Sir Clements. Now, in this rush I remember that one of the first letters that really held me was a letter which mentioned the work of old Storm van 's Gravesande. That letter was written by the Rev. George Edmundson, who is near me this evening. Directly I saw that letter I said, "Here is a man who knows something about his work." At that time he was brought into the question, and was of great value to us all.

I have mentioned Storm because Storm was the centre of the lecture to-night; and at that time, after reading his dispatches and seeing their general interest, attracted by the way in which time after time he would quote his Horace and Virgil, Shakespeare, and Molière in the middle of his dispatches, I said I must really write his life if I could ever make time. But whether it would ever have been done but for your lecturer of this evening, my friend, Mr. de Villiers, I really doubt. It was because of his wonderful devotion to his subject, and the help of Sir C. Markham and the Hakluyt Society, that we were enabled to publish what I really think is a contribution to the history and geography of British Guiana.

I have never been in the colony myself, never nearer than to see the sun setting in its glory across the gulf from Trinidad; but there is a romance that lingers now as you look across the gulf to the old Spanish main to which our ancestors sailed, and it fills one with an enthusiasm which is never lost. Although I have never been there, yet by poring over its maps, by being forced to follow every track of the explorers, I really do seem to know my way about British Guiana very well.

Now, I think that one thing that stands out from one's examination of the

geography of British Guiana is that it is very largely a child of the Royal Geographical Society. It is true that it was the old Dutch traders who really opened up the country at the beginning; then you get a man like Storm who had the power of organizing and focussing all this exploration, and amid all his difficulties he did a great deal for the geography of Guiana, for he was a man of scientific mind, in touch with the scientists of his day, as I could show you in connection with more than one incident, *e.g.* that question of d'Anville's reversion in 1760 to an old piece of mapping, to which our lecturer referred. Yet with Storm's death all knowledge of Guiana was lost; and it was the Royal Geographical Society who, stirred by Humboldt's account of his Orinoco explorations, sent that remarkable man Schomburgk on a series of explorations which it would be quite worth while to connect up in a reasoned examination with the old Dutch explorations on the one side, and again with the equally interesting explorations of Barrington Brown, Im Thurn, and McTurk on the other.

Rev. G. EDMUNDSON: I am extremely interested in the subject of Mr. de Villiers' paper, for I think I may say with Mr. Harris, that when my work upon the arbitrations was over I knew the geography of British Guiana better than that of any county in England. In regard to Mr. de Villiers' excellent paper, I feel that he has been inclined to lay too much weight solely upon the Dutch official records, and not to emphasize sufficiently the amount of work the Dutch did in Guiana unofficially. The amount of exploration carried out by the Dutch in the early part of the seventeenth century was perfectly extraordinary, as I dare say most of you know; but we learn about their presence in these parts, not so much from their own records as from those of the Spaniards and Portuguese. The Spanish records tell us that already in 1599, and the years that followed, the Dutch were to be found frequenting all the islands, rivers, and creeks on the shores of what was then called the Wild Coast of Guiana, and the Spanish authorities were very dissatisfied with their presence there. We also hear a little later of their having settlements upon the Corentyn, and also of their penetrating up the Orinoco with their wares, selling their goods to the natives and even to the Spaniards themselves. This shows a very great activity in those regions—we may say a prehistoric activity so far as the Dutch records are concerned. And we find further this curious fact, that the Spaniards themselves were so impressed by the skill and the energy and the perseverance of the Dutch, and by their tact in trafficking with the natives, that they used to employ Dutchmen as pilots and sailors in their ships and as trading factors in the interior. Groenewegen, of whom Mr. de Villiers has spoken, seems to have been a factor of the Spaniards before he entered into the service of a private Dutch firm, and laid the first foundations of what is now British Guiana. Indeed, I think we may say that in these early days the Dutch probably had a larger sphere of activity than at any later period. We have evidence from Portuguese and Spanish sources of the Dutch penetrating at this time right down to the Amazon and the Rio Negro, and having knowledge even of the wonderful river, the Cassiquiare, which joins the Orinoco with the upper Rio Negro; and what is more, I think but for the English wars there would have been a much larger settlement of the Dutch in the colonies of Essequibo and Berbice than actually took place. The English wars, as you know, crippled the Dutch trade, for although they fought so gallantly, and although they gained a great deal of glory, they lost their powers of free communication with their colonies, and this led to these colonies being neglected. Consequently, this colony of Essequibo and the

others on that coast were practically very neglected for some time owing to the English wars; but after the English wars were over the Dutch gained some territory there, namely, the colony of Surinam in exchange for New York. By the peace of Breda, in 1667, Surinam became Dutch and New York became English, and from this time the interests of the Dutch were far more centred upon the development of Surinam than they were upon their older colonies. But there was a revival during that period when William III. was, as I have heard Dutchmen say, "Stadholder of England and King of Holland." During his time the rivalry between the Dutch and English ceased, and a fresh prosperity arose in these parts; and I venture to say that the colony of Essequibo at the end of the century probably was in a more flourishing state than at any other time under Dutch rule. But this period of William III. gave the death-blow to Holland's great commercial and colonial prosperity. William III.'s whole interest was centred upon European politics, and his one object was to band together England and Holland as the nucleus of a grand alliance in opposition to the schemes of Louis XIV. In this union of the two sea powers Holland had to play the second fiddle, and her decadence steadily set in with the Peace of Utrecht. Therefore Storm has the more credit for what he did during that long period during which he held rule as governor in Essequibo and Demerara, because of the miserable support he had from home. He had no funds, he could get no help in any way, and therefore for what he achieved as an administrator, and for the explorations he carried out, the praise given by Mr. de Villiers is not too high. The sound foundation he left, on which our modern British Guiana is built, was the life-work of the man himself.

The PRESIDENT: All geographers are very ready to assert, no doubt truthfully, that the history of a country cannot be understood without a knowledge of its geography; but they are not quite so ready to admit that we cannot understand the geography of a country without knowing something of its history—a truth which has been well illustrated by Mr. de Villiers' paper. This colony, as we know, lies on the banks of three rivers, the Essequibo, the Demerara, and the Berbice; and after listening to this lecture we shall, whenever we look at the map of that region, be reminded of that striking personality, Storm van 's Gravesande. We ought to congratulate Mr. Harris and Mr. de Villiers for rescuing his name from its most unmerited oblivion. We must also, at the same time, always be reminded of the work done by Sir Robert Schomburgk, work which proved to be of such extraordinary value in the Venezuelan arbitration cases. And, lastly, we shall not readily forget the very interesting lecture we have just had delivered to us, for which our sincere thanks are due to Mr. de Villiers.

MR. CANNING'S EXPEDITIONS IN WESTERN AUSTRALIA, 1906–7 AND 1908–10.*

REFERENCE was made in the *Journal* for June and November, 1907 (vol. 29, p. 678; 30, p. 565), to the successful expedition carried out by Mr. A. W. Canning from Wiluna, in the back-lands of Western Australia, to the Kimberley district and back, with a view to the possible opening of a stock-route across the great arid area which occupies the northern interior of that state, and which the reports of previous

* Map, p. 112.

CAMELS TRAVELLING OVER SANDRIDGES.

OPEN GRASSY DOWNS, EAST KIMBERLEY.

CAMELS CROSSING TOBIN LAKE, WITH OAKS IN BACKGROUND.

WARDABUNNA ROCKHOLE.

explorers had indicated as an inhospitable waterless tract, incapable of utilization. We are now able to give a detailed map of the route of the party, based on the large-scale map prepared after Mr. Canning's return at the office of the Department of Mines, Western Australia, but not generally accessible to the public. Besides this map, Mr. Canning has sent us a narrative describing the main events of the trip and the nature of the country traversed; but as a full account of the journey was printed in the report of the Department of Mines for 1907, it will be sufficient to give here a brief summary of the principal points.

The tract which was the scene of the exploration had been in part touched by the routes of Sir J. Forrest (1874) and Ernest Giles (1876), who crossed its southern part in a direction from west to east, and by those of the Hon. David Carnegie (1896–97),* and of Mr. L. A. Wells and his companions in the same years. The latter had led mainly from south to north, but a considerable extent of unknown country lay between them, especially in the north of the area, and Mr. Canning's route (which ran from south-west to north-east) was so chosen as to intersect these unknown areas. Although both Mr. Carnegie and Mr. Wells had given accounts of the country which made it hardly seem likely that sufficient water and feed for travelling stock would be found, Mr. Canning was sanguine; and, as it turned out, his views were justified by the event.

The expedition, which was equipped under Government auspices, and consisted of seven men, twenty-two camels, and two horses, left Wiluna—a goldfield township some 780 miles north-east from Perth, and the farthest settlement in the interior of Western Australia—on May 29, 1906, and for the first 160 miles traversed a fair pastoral country, with water-supplies at frequent intervals, so that no difficulty was experienced in reaching Weld springs, where the serious work of the expedition began. Beyond the fine native well named Goodwin Soak, heavy sand-ridges and spinifex country began, with scattered gums, wattle, quandong, and desert oaks. The last named (a tree of the *Casuarina* type) yields a valuable timber, and it occurred in patches right up to Sturt creek. For about 90 miles no wells were met with, but by the help of a native one was at last found, which, on being cleaned out, yielded an ample supply of excellent water, and afforded hopes that good supplies could also be obtained in the country ahead. A feature of the area traversed was found to be the general absence of sand-ridges to the west and north-west of groups of hills, owing to the prevalence of winds from the south-east; and as these open spaces were covered with mulga and other bushes, as well as with fair grass and herbage, a knowledge of the fact proved helpful. As the party advanced, the country consisted at times of poor sand-ridges and spinifex, but at others afforded fair feed for the camels in the way of various edible bushes, grass, and soft spinifex, while with the help of the natives wells continued to be found. Their number was in places

* See *Journal*, vol. 11, pp. 258 *et seq.*, with map.

surprising, the intervals between them being only 2 or 3 miles, and they usually occurred in sandstone. Lake-beds, covered with soil and yielding good grass and other herbage, were also met with. For the last 200 miles the country was parched, owing to the fact that the summer rains had been the smallest for fifteen years in Northern Australia, and on arrival at Godfrey's tank it was found to be dry. On reaching the lakes into which Sturt creek empties itself, better grass country was met with, and up the creek itself there is really excellent pastoral country, with ample feed and water in a normal season. By this way the open downs of East Kimberley—the finest grass country ever seen by Mr. Canning—were reached, and the journey of over 1000 miles was successfully completed. The return was delayed not only by the necessary rest, but by heavy summer rains; but the journey was again successfully accomplished, a further examination of the country being made, and Wiluna was reached on June 30, 1907.

Mr. Canning having reported favourably as regards the opening of a stock route, he was placed in command of a new party fully equipped for the necessary operations to give effect to his recommendations. It consisted of twenty-six white men and one black boy, with sixty-two camels, two waggons, three horses, and everything necessary for the construction of a large number of permanent wells, besides food-supplies for two years. Work was begun on April 4, 1908, and during the next two years it was actively continued, the result being the construction of fifty-two wells, all measuring 6 feet by 4, timbered in many cases, and equipped with windlass and buckets, as well as with galvanized iron troughing. The average depth was only 33 feet, though some were much deeper. Most were in the central part of the area, formerly considered waterless, and these gave large supplies varying from 500 to 4000 gallons an hour. At either end of the route the wells were deeper and the supplies not quite so good.* The work was naturally arduous, as all the equipment had to be transported from the starting-point, and in the summer the heat was intense—120° day after day for weeks. In the end a well-equipped line of wells had been completed for over 800 miles, over which cattle could be driven with the certainty of getting a good supply of excellent water at easy stages, and with the prospect of finding sufficient feed to permit them to reach the populated part of the south-west in really good condition. Although a good deal of the country is covered with spinifex and sand, other parts yield sufficiently good feed to be gradually utilized, and for this purpose the line of wells will be useful as depôts from which prospecting can be carried on. The opening up of an easy route from the mining districts to the fine pastoral

* The numbers on the map refer to the permanent wells equipped during the second expedition, while the descriptions (taken from Mr. Canning's original map) apply to their condition when used during the former one.

WINDICH SPRINGS.

LOWER POOL, KILLAGUVVA SPRINGS.

NATIVES, STURT CREEK.

NATIVE DRAWINGS, KILLAGUVVA SPRINGS.

area in the north-east, now almost unoccupied, is also valuable. This country has a good climate and excellent rainfall, and would grow almost any sub-tropical plants successfully.

Much help was obtained from the natives, who proved generally friendly and ready to disclose the positions of their wells, and the places where feed was best. They were scattered in families throughout the area, and though not in large numbers in the drier parts, towards Sturt creek they were found in parties of two hundred and over. They wear no clothing, have no habitations, and depend absolutely on natural sources of food-supply. They apparently have no religion, and seem generally to be cannibals. Their language changes rapidly from south to north, but their marriage customs, etc., seem practically the same throughout. Physically, they are clean limbed and active, and possess a marvellous instinct of bushmanship, and a capacity for tracking which will make them useful on occasion as stockmen.

THE RIVER ARUWIMI.*

By ROBERT L. REID.

In considering the economic value of a great waterway, a question of first importance is its capacity for transport. The Aruwimi (or, to give it its proper name, Luwari, or Luari †), between Basoko and Avakubi, carries on its waters a constant stream of traffic, furnishing a safe and cheap means of transport over 350 miles, for this most important service. Provisions and other necessaries for the governing body of whites, and merchandise and articles of exchange for the native population, pass daily up its course, and the fleets of canoes necessary for the transport make the return journey loaded with rubber and ivory. This in turn is discharged at Basoko into large river steamers, taken down the Congo to Leopoldville, and thence by rail and ocean steamers to the markets in Europe.

During the wet season the Aruwimi is navigable as far as Yambuya for steamers up to 30 tons burden, drawing about 3 feet when loaded. They make the journey against the current in something under two days, including stops, and return to Basoko in about half that time. At low water, however, encounters with obstructions are liable to considerably extend the run. New sandbanks form at every flood, while old ones are displaced or washed away, making it impossible to lay down a permanent fairway on any chart; the downstream end of an island is in general a

* Map, p. 112.

† Stanley probably added -imi to the name given him, not knowing that the latter word merely stood for "it is" in Kingalima. Example: "Imi Kwakwara," "it is hard," or "you are strong." A natural answer to the question, "What is the name of the river?" would be "Luari it is." For the sake of euphony, the final *i* in Luari would naturally change to *u*, and the answer would probably be "Luaruimi."

place to be avoided; while deep water may be looked for quite close to the banks or alongside the larger islands. The river commences to rise about August, reaching its maximum usually in November, and then gradually falling till April, when the light rains will keep it about medium height until the following August. Varying seasons alter these dates slightly; 1909 was a very wet year, the river rising in November to an exceptional height (about 22 feet at Panga above the lowest, April 1908, reading). Between Basoko and Yambuya the river is not marked by any great alterations to the usual trend of its channel, but flows placidly along between low banks for the most part, varied occasionally by steep clay sides and at Baonde by white sand cliffs. Many islands, some of considerable size, mark this stretch; all are heavily wooded. No rapids occur here, but the battered appearance of some of the plates in the steamers testify to the existence of occasional rock. The rapids begin at Yambuya, and, continuing, make a dangerous and rough bit of water up to Ilungo, necessitating at Yambuya a portage of about a mile. From here all goods are transferred to dug-out canoes, and commence their long journey towards the head of navigation at Avakubi. Receiving stations are placed at Yambuya, Banalia, Panga, Bomili, and Avakubi; each has its own transport fleet of dugouts and permanent canoe-men, the latter supplemented from the native villages along the river as occasion arises. Most of the larger villages contain a good rest-house, built and maintained by the natives, for the use of white passengers, and, unless exceptional circumstances occur, these can always be reached by the traveller from day to day.

Rapids are met with at intervals throughout the whole course of the river; some of these may be shot safely at high water, but many necessitate unloading and portering all the cargo round the dangerous stretches (averaging about a mile at a time), the canoes being taken through empty. A village is always established at or near these spots, on the inhabitants of which devolves the duty of portering and taking over the canoes, the regular crew loading up and resuming the voyage when quieter water is reached. The worst place is at Panga, where a great earth-fold crosses the country in a north-west to south-east direction, through which the river has torn a way into the jagged masses of upturned rock, over which it dashes with terrific force, and a booming sound that can be heard some miles on a still night. These falls are the only complete bar to canoes on the river, and on occasion even they can be surmounted by special crews of the villagers whose home is situated on the high bank overlooking the cataract.

The Aruwimi follows generally an east and west course; it reaches its northern limit at Mokupi about 10° 58′ 20″ N. lat., whence it gradually works back southerly to Avakubi to within 6″ of its latitude at the mouth at Basoko. Its middle and upper stretches are marked at intervals by sharp bends, where hard country has turned the

TYPICAL SANDBANKS, KASAI RIVER.

PANGA RAPID.

WANGILIMA OF PANGA. TYPE OF CANOE-MEN.

WANGILIMA WOMEN, ARUWIMI RIVER.

original course into softer formations. No affluents of great size occur until Bomili is reached, at which place the Nepoko joins on the north bank. This great branch (second only in size to the Aruwimi itself), with its tributary the Nava, drains the country nearly up to the third degree of north latitude, and extends its heads easterly to the Nile-Congo watershed, north and west of Lake Albert. Only a few miles above the Nepoko another large branch, the N'Gayu, comes in, also on the north bank, its course lying between the Nepoko and Aruwimi, and its heads rising in the granite ranges between Nepoko and the Epulu. Minor tributaries occur in the lower and middle parts of the Aruwimi; those on the north bank running back 20 miles or so. No great branches come in on the south, but countless small creeks drain the country on both sides, their mouths for the most part hidden by the dense vegetation which clothes the river-banks.

Above the junction of the Nepoko and N'Gayu a noticeable diminution takes place, the river contracting to about 200 to 300 yards, and reducing in places to under 100 yards in width. The densely wooded banks shut out all view from the river; but ridges or low hills occur on the right bank between Mogandjo and Yambuya; thence no high country can be seen until approaching Panga, when hills come in view on the north bank, rising to some 300 to 400 feet. This low range crosses the river and causes the cataracts at Panga, the rapids at Jambe, and much broken water up to Karagba. Sights to hills lying near the river can be taken above Bomili, at Mombatili, and Yenga; low ranges can also be seen from Avakubi, but none appear to rise more than 200 to 300 feet. Openings in the forest of a few acres in extent occur from time to time on either bank, marking the sites of old villages, and low scrub and an absence of heavy timber indicate where clearings still older have existed, but are now being quickly grown over by the encroaching forest. In some cases lines of old mussel-shells and village *débris* can be seen at these spots, the remains of kitchen middens. With these exceptions the banks are heavily wooded throughout. The river itself is remarkably clear of swamp, grass, or sudd of any description.

Fish abound, and are taken by the natives in baskets and weirs, generally at the rapids and the mouths of small creeks. Game animals are not plentiful, elephants being the principal and most numerous; crocodiles are sometimes seen sunning themselves on the sandbanks; an odd hippopotamus and a few buffalo tracks are occasionally met with; and the natives get small antelopes by placing nets across the runs in the forest. These are principally a grey and a red duiker, and the water chevrotain. The okapi and bongo both exist in the forest, but are seldom taken, and an otter is known. The forest, however, is full of monkeys, and these may be seen every day from the canoes. Two or three varieties were noted, the most plentiful being a dark brownish-grey, with rufous tail and a white nose; large baboons are seen coming

down to drink, and the chimpanzee is heard at night, but as they inhabit the gloomiest parts of the forest are seldom seen. Water-birds are scarce; a few flocks of ducks, an occasional goose, and two or three varieties of cranes or herons. Forest birds are more plentiful; unwieldy-looking hornbills are seen flying across the river; many pigeons, a few partridges, and guinea-fowl can be shot, and I found what appeared to be a black variety of the latter.

If animal and bird life is not so plentiful as might be expected, the same cannot be said of the insect world. Butterflies at certain seasons arrive in their millions, all apparently travelling in one direction; they are filthy in their habits, and almost as great a nuisance as flies. Bees great and small, the former with a formidable sting which they do not hesitate to use if removed too roughly from bare arm or neck. The small black bee is, however, without a sting. Both kinds pitch on one where any moisture of perspiration shows. A favourite place of the small bee is the interior of one's helmet, the ventilating holes forming a convenient tunnel through which they creep. Flies of every variety abound, from the hippo fly over an inch in size, down to sand-flies so small that muslin will not keep them out. All seem to have but one object in life, viz. to make a meal off the unfortunate human being they pitch on. Tsetse fly are numerous; they love to fly quietly to the back of one's chair, out of sight, and from there walk to a bare elbow or neck, or from some dark spot on the floor make their way slowly up one's leg, where they fill themselves with blood. Sitting cramped in a canoe, the traveller is certainly bitten by them every day.

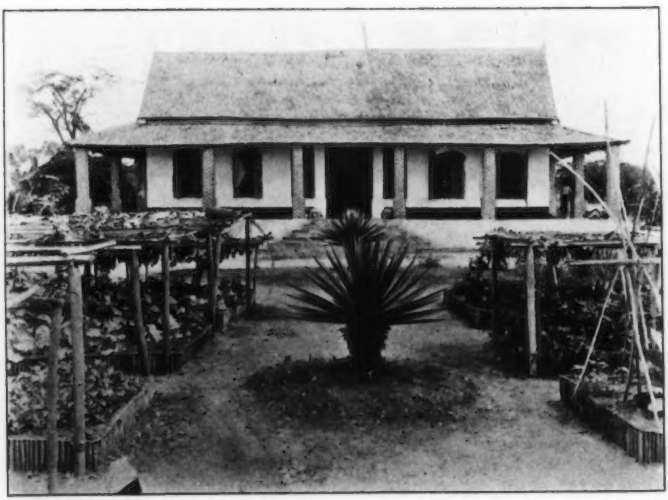
Sleeping sickness has not yet made its appearance on the river proper; but it probably is expected, as the authorities are preparing in a way by having the villages and portages brushed. Just below Basoko there is a lazaret of sleeping-sickness patients, with a white doctor in charge, and if the Aruwimi tsetse get infected a bad time will result, as there is no break in the range of the fly as far up the river as I have been.

The native villages are located close to the water, generally on a high clay bank. From about Yambuya up, they build the high cone hut something like huge extinguishers. Some are round in shape, others square, but none larger than 7 to 8 feet across. The walls are made of small sticks, driven closely together into the ground and plastered with clay; the floor is raised a foot or 18 inches of well-beaten earth; the roof rises to a point some 12 to 15 feet above the walls, and is covered with three or four thicknesses of large leaves laid like the scales of a fish and sewn on with cane; the apex is generally finished off with an old pot, or perhaps a bit of basketwork plaited round and stuck through with a few skewers like Japanese hatpins.

Bananas and manioc are grown, and with fish form the staple food of the natives. Maize and ground-nuts are also cultivated in a lesser

CONE HUTS OF THE WANGILIMA, ARUWIMI RIVER.

AVENUE OF MANGO TREES, FLANKED WITH OIL PALMS, AVAKUBI STATION.



CHEF DE SECTEUR'S HOUSE, BANALIA.

degree. Rice is being introduced with some success, especially where colonies of time-expired soldiers and workmen have been installed. These people are also expert in growing and curing the native tobacco, which is much sought after.

The riverine people may be divided roughly into three groups—Basoko near the mouth, Mongalima in the middle, and Mobali towards Avakubi. Subdivisions are met, probably caused by overlapping and fusion with the forest people.

The Popoie occupy a large tract back from the river on the southern bank, and on the northern side various small tribes of Babua, Mombuli, Makeri, Medje, etc., are passed before one comes to the larger tribal divisions of Mangbetu and Azandi. The Mangbetu language seems to influence most of the dialects spoken among the above tribes, but for trade purposes Bangala is used on the lower river and Swahili from Panga up, and both these languages are understood everywhere. Arabs and their mixtures are first encountered at Mongalulu, and at Avakubi there is a very large settlement of them. These people (called Mongwana) are established principally along the larger main tracks, and they extend east to the English borders; they cultivate rice largely, and own goats and a few sheep and cattle There is a *poste restante* at Basoko and at Avakubi; a system of mails by canoes serve the intermediate stations at intervals of a fortnight or three weeks, the state of one's correspondence at times indicating that part of the journey has been made under water.

Transport labour is cheap and plentiful on the river as yet, but if it failed at any time, there are stretches of many miles right up to Avakubi where a small launch could tow strings of laden canoes, and a few charges of dynamite at the rapids would enable many of them to be passed; so that the river Aruwimi will ever remain a most valuable asset to the state and the rich country through which it passes.

FORMATION OF THE MAP.

Starting from Basoko in the early part of 1908, a compass traverse from canoes was made as far as Panga, and during the same year various short traverses were made on different parts of the river.

In November a traverse was made from Basobangi to Panga. During 1909 two journeys between Dima and Basoko, and in the beginning of 1910 a voyage from Dima to Avakubi, and from Avakubi a return right down to Basoko. All these were canoe voyages. Observations were taken at night on stars for time and latitude, and during the day attention was paid to traversing with 5-inch prismatic compass and watch; bearings being taken to bends, islands, prominent trees, etc., and the times noted. Widths of the river were measured at intervals with the instruments, but mainly depend on estimate and plotting from cross-bearings. Magnetic plottings of the traverses were made on the spot for the use of the expedition, but since my return to Europe I have worked up all the astronomical data and corrected the traverses to the positions so found. Where different traverses are of equal value, I have adopted a mean, but in some cases

single traverses are known to be better than others, and I have either kept to these, or given them a weighted value.

Latitudes were obtained by circummeridian altitudes of north and south stars, or, when this was not possible, by the sun. The results obtained by the north and south stars agreed with each other, in all cases, within a few seconds of arc.

For absolute longitude, occultations of stars by the moon were observed at the base camp, Dima island, and one occultation was observed at Mokopi camp, mostly under unfavourable conditions. The observation of η Leonis, on June 22, 1909, at Dima island, was particularly good as regards weather conditions, preparation for observing, etc., and, being on a large star, is believed to be of much the best value. I have adopted the resulting longitude from this observation as a basis (one of the others, marked indifferent in my notes, only differs from this by 11″·4). All other longitudes are chronometric differences, starting from this point. Basoko is placed 3′ 16″·4 further west than the position on Grenfell's map, assigned to Delporte.

Captain George's mercurial barometer was filled at Yambuya, Banalia, and Avakubi, and was kept set up at Dima for about a year, and midday readings taken fairly regularly, together with the height of the thermometer. The height of water in the river was also noted daily. Variation of the compass was ascertained at intervals, by observations on stars or the sun compared with their astronomically determined azimuths. For the shapes and sizes of some of the islands between Mogandjo and Basoko I have made use of an existing chart.

The instruments used were as follows:—

5-inch transit theodolite by Casella, fitted with Reeves' micrometers to both circles.

Half chronometer watch, R.G.S. pattern by Blockley.

Split seconds stop-watch.

5-inch prismatic compass.

Astronomical telescope 2½-inch object glass, by Cary.

George's mercurial barometer, by Cary.

3-inch surveying aneroid.

Swing and ordinary thermometer.

THE FLOWING WELLS OF CENTRAL AUSTRALIA.

By Prof. J. W. GREGORY, D.Sc., F.R.S.

I. Introduction.
II. The Term Artesian.
III. The Run-off of the Darling and Murray rivers.
IV. The Loss by Percolation:
  (*a*) The Blythesdale Braystone.
  (*b*) Other Possible Intake Beds.
V. The Sources of the Subterranean Water:
  (*a*) The Diminishing Yield.
  (*b*) Meteoric Water due to Ancient Infiltration.
  (*c*) Residual Water.
  (*d*) Plutonic Water.
VI. Difficulties of the Water Pressure Theory.
  (*a*) The Limitation of Water Pressure.
  (*b*) Irregularities in Potential Level.
  (*c*) The Toowoomba Sandstones as a High-pressure Reservoir.
  (*d*) Oscillating Wells.

VII. The Cause of the Ascent of the Water.
(*a*) Gas Pressure.
(*b*) Rock Pressure.
VIII. The Chemical Composition of the Well Waters.
IX. Summary of Conclusions.
Appendix: List of Analyses of Well Waters used in Fig. 14.

I. Introduction.

The discovery in eastern Central Australia of deeply buried water, which is under such pressure that it flows to the surface when reached by a bore hole, has effected a great economic change in the wide areas thus supplied. The water has so far proved inadequate for extensive irrigation, for which its quality is often unsuitable; but it is of incalculable service for domestic purposes, for watering stock, and maintaining stock routes, and its judicious use is a question of primary importance to those parts of Australia blessed with it.

The general distribution of this water is now well known (Map, Fig. 1). It ranges through an area of some 580,000 square miles, including more than half of Queensland, the north-western part of New South Wales, and the north-eastern corner of South Australia. Its suggested extension further south-westward and connection with the artesian area at the head of the Great Australian Bight may now be regarded as finally dismissed, owing to the failure, as predicted by Mr. J. W. Jones and myself, of the deep bore at Lake Phillipson.

The general policy has hitherto been to allow the flowing wells to run continuously, although for days together not a drop of the water may be used and it is then all worse than wasted, for its evaporation saturates a good soil with injurious salts. This policy has been justified on the ground that the water of these flowing wells comes from the Eastern Highlands of Australia, and that its replenishment, by percolation into the water-bearing beds from rainfall and rivers, so enormously exceeds the discharge that the loss of water is unimportant. The evidence does not seem to me to support the theory as to the nature and supply of these wells on which that estimate was based, as I endeavoured to show in an account of them published in 'The Dead Heart of Australia' (1905), pp. 271–341. My discussion of the subject has been severely criticized by Mr. Pittman, Under-Secretary for the Mines Department of New South Wales, in a lecture to the Royal Society of New South Wales.*

I thought it advisable to wait until five years' further evidence had accumulated before writing again on this question; and now, considering the importance of the question to Australia, and that my views were not correctly represented, it is as well to restate the problem and reply to the arguments advanced to support the old theory of the nature of these wells.

One striking feature in the various criticisms is the great change of opinion in reference to the practical question at issue. The old assurances that the waste of water is unimportant have not been repeated, and the conclusion that it should not be allowed to continue appears to be now generally admitted.

A second feature in Mr. Pittman's lecture is his clinging to a theory of subterranean waters, which is now being widely abandoned. He commends the dictum that "all underground waters have their origin in rainfall," with which

* E. F. Pittman, "Problems of the Artesian Water Supply of Australia, with Special Reference to Professor Gregory's Theory," *Journ. R. Soc. N. S. Wales*, vol. 41, 1907, pp. 100–139, pl. viii. Also published by the Geol. Surv. N. S. Wales, 1908, 30 pp. 3 pls. Subsequently referred to as "Clarke Lecture."

Dr. Slichter opened his memoir on 'The Motions of Underground Waters.' * The most striking development of opinion on subterranean water during the past five years has been the general abandonment of that view. Geologists long since recognized that the interior of the earth is a source of water; † but engineers have been reluctant to admit this possibility, perhaps because it introduced an incalculable factor, until convinced by such evidence as that from the Simplon Tunnel. The complete absence of chlorine from hot water discharged into that tunnel is now accepted as proof that such water came from a plutonic, and cannot have come from a meteoric source. Thus Mr. F. Fox describes a spring which poured into the tunnel 3036 gallons per minute of water at 114·6° Fahr., and containing 106 grains of mineral matter per gallon; and he concluded, "the complete absence of chlorine is believed to be unique and seems to indicate that the water was possibly entirely plutonic, having never been on the surface of the globe." ‡ Mr. Bertram Blount, in the discussion on Fox's paper, added that the conclusion was irresistible that the water had never been on the surface of the globe—that it was, as the author said, "plutonic." § The publication of Professor Suess' paper insisting upon the "juvenile" or plutonic origin of the waters of the Karlsbad Springs also quickened the acceptance by geologists of the importance of the deep-seated source of water.

Mr. Pittman appeals in his criticism to the authority of various American geologists, who play the part of Balaam. Thus Mr. Pittman rejects as quite untenable my suggestion that the tidal oscillation of a well at Urisino is a phenomenon allied to that of periodic geysers; but, a few months after my book was published, Professor Slichter, to whose opinion Mr. Pittman justly attaches so much weight, independently made the same suggestion. Mr. Veatch, who published Professor Slichter's conclusion "that the fluctuations are due to a sort of periodic geyser phenomenon," ‖ accepts this view as "the very probable explanation," and adds that the high temperature of the water "lends considerable colour to the suggestion." My view as to the nature of the Urisino well ¶ has therefore been supported by these two American authorities.**

Again, Mr. Pittman quotes a letter from Mr. M. L. Fuller to the effect that rock pressure is of no effect as a cause of flowing wells. But Mr. Fuller has since published, as one of the Bulletins of the United Geological Survey, a memoir on 'The Factors that control the flow of Artesian Wells,'†† and amongst them rock pressure is duly admitted. Mr. Fuller, moreover, on behalf of the United States Survey, has adopted a definition of artesian wells according to

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* C. S. Slichter, 'The Motions of Underground Waters,' Water Supply and Irrigation Papers of the United States Geol. Surv., No. 67, 1902, p. 13.

† The evidence for the escape of magmatic water from the interior of the Earth has been stated, I think convincingly, by A. Harker in his 'Natural History of Igneous Rocks' (1909), pp. 45–48.

‡ F. Fox, "The Simplon Tunnel," *Proc. Inst. Civ. Eng.*, vol. **168**, p. 77.

§ *Ibid.*, p. 97.

‖ A. C. Veatch, 'Fluctuations of the Water Level in Wells, with Special Reference to Long Island, New York,' U.S. Geol. Surv. Water Supply and Irrigation Paper, No. 155, ser. O, Underground Waters, 52 (1906), p. 76.

¶ 'The Dead Heart of Australia,' p. 330.

** My book was published in April, 1906. I had taught this view some years before. A list dated June, 1906, is included at the end of Mr. Veatch's memoir, which was received in the Geological Society's Library at the end of December, 1906.

†† M. L. Fuller, 'Summary of the Controlling Factors of Artesian Flows,' Bull. 319, U.S. Geol. Surv. (1908), pp. 28, 33, etc.

SKETCH MAP OF NORTH EASTERN AUSTRALIA SHOWING THE AREA WITH FLOWING WELLS; & THE DISTRIBUTION OF THE SUPPOSED INTAKE BEDS IN QUEENSLAND.

FIG. 1

Nat. Scale 1:15,000,000 or 1 inch = 236·74 Stat. Miles. 100 50 0 100 200 Miles.

The three divisions of Well Basins are divided thus C------D A------B.

Jurassic, in places capped by Basalt.

Blythesdale Braystone.

Boundary of the Area of Flowing Wells.-------

which, if Mr. Pittman's theory be correct, the flowing wells of Australia are not artesian.

Mr. Pittman remarks (Clarke Lecture, p. 103) that my opinions are of no authority, as I had only visited the South Australian part of the artesian area. They have, however, been strengthened by a subsequent visit to a typical part of the supposed intake area in Central Queensland. I have thus seen two of the three areas concerned, whereas I understand Mr. Pittman knows personally only the limited portion of the artesian basin, about one-seventh of the total area, which occurs in New South Wales.

The question of personal knowledge of the area is only worthy of reference because Mr. Pittman attributes to me a mistake in reference to the Maria Creek bore, and says that I fell into this error through want of personal knowledge of the localities. The supposed mistake is due to reversal of my statement. I am misrepresented as saying that the Maria Creek bore is in the artesian area, whereas it is sixty-five miles to the east of it. I referred to the Maria Creek bore three times,* and on the first occasion was careful to explain that the bore is "to the east of the artesian basin," and it is shown outside it on my map opposite p. 314. When Mr. Pittman in his 'Mineral Resources of New South Wales' (p. 212) says "at Jamberoo to the west of Kiama," he would not expect to be represented as saying Jamberoo is in Kiama. My reference to the Maria Creek well was to show that the saltest water in the deep Queensland wells is not that which has percolated for a great distance westward through the sandstones, but actually lies outside of the artesian basin. The Maria Creek well is, however, described as artesian in the official list issued by the Queensland Water Supply Department;† hence, as Mr. Pittman regards this opinion as a mistake due to local ignorance, he is attributing local ignorance not to me but to Mr. J. Baillie Henderson, the head of the Queensland Water Supply Department!

The practical issue concerned in the nature of the flowing wells of Central Australia is the need for control of their discharge. Legislation to prevent the continued enormous waste of the well waters passed the First House of Parliament in Queensland in 1891. The Second Chamber rejected the Bill on the ground that the outflow from the wells was so insignificant compared with their continuous replenishment by rainfall, that the proposed legislation was unnecessary. This conclusion was based on the view that the wells are supplied from the rivers that flow down the western slopes of the Eastern Highlands of Australia; it was held that these rivers pour much of their water into some porous beds, which underlie Central Australia, and when these beds are reached by a bore, the water is forced to the surface by the pressure of the water at a higher level in the eastern part of the beds.

The water pressure theory of the flowing wells was naturally the first explanation to be considered; but the mass of evidence now available shows that this hypothesis is quite inadequate. Many of the facts indicate that part of this water comes from a plutonic or deep seated source; and that the ascent of the water is not due to the simple principle that water will find its own level, but arises from more complex causes, including rock-pressure, and gas-pressure produced by the heat of the plutonic water. I accordingly hold that the water

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* 'The Dead Heart of Australia,' pp. 312, 318, 331. The second reference is to it as one "of the Queensland well waters," following a mention of the Brisbane well.

† J. B. Henderson, 'Tables of Artesian Borings, Perennial Springs, and Water Analyses.' Queensland Water Supply Department, Brisbane (1908), p. 46. This work is subsequently referred to as "Henderson's Tables."

discharged from the flowing wells is in the main an old accumulation, and that its waste is deplorable and should be stopped; and I am glad to find that my two severest Australian critics now both agree with that policy.

II. The Term Artesian.

These wells are usually called artesian, a term now used with very different meanings. Mr. Fuller announced in 1908 that the Geological Survey of the United States, after consultation with the leading geologists of that country, has adopted the term artesian, "to designate the hydrostatic principle by which confined waters tend to rise in virtue of the pressure of the overlying water column, whether or not this pressure is sufficient to lift the water to the surface and produce a flow." * This definition seems to me open to serious objections. It involves using a well-known term with an essentially different meaning in science from that adopted by the practical and commercial world. Chamberlin and Salisbury † have pointed out that the term artesian is now applied to any notably deep well. Mr. Kyle, of Galston, the head of a leading British firm of well-borers, tells me that the term in the engineering world means a well that is bored in contra-distinction to a well that is dug; and that meaning is probably now too firmly established popularly and commercially to be changed.

A second objection is that the application of the restricted definition would be often difficult or impossible, for water rises to some extent in practically every deep well that reaches a water-bearing layer; and in isolated wells it may be impossible to determine with certainty the cause of the ascent of the water. Until that problem has been settled, it would remain doubtful whether a flowing well should or should not be called artesian. Thus in South Idaho, I. C. Russell ‡ has shown that some of the flowing wells discharge cold meteoric water and some of them warm plutonic water. He recognized that some of the hot waters are forced to the surface by other than hydrostatic causes, and in some of the wells of that basin the rise of the water is probably due to two agents. So that according to the definition announced by Mr. Fuller some of the flowing wells of South Idaho would be artesian, others would not be artesian, and the application of the term to others would be doubtful.

Again, it may be objected by those who lay stress on the difference between wells under hydrostatic and hydraulic conditions that, according to Mr. Fuller's definition, wells under hydraulic pressure are not artesian.

It seems to me, therefore, that it would be more convenient to use the term artesian as adopted in practice; and if so, the Australian wells may be described as artesian without admitting that they flow through water pressure. A new name might be given to wells in which the water rises by hydrostatic pressure, corresponding to Daubrée's terms Pelozemes or Pelocones for wells flowing through gas and rock pressure.

The term "flowing well" has the advantage of being simply descriptive, and it has been adopted by some recent American authors, as by Leverett § in

* M. L. Fuller, "Summary of the Controlling Factors of Artesian Flows," Bull. 319, U.S. Geol. Surv., p. 8. 1908.

† T. C. Chamberlin and R. D. Salisbury, *Geology*, vol. 1, p. 229. 1904.

‡ I. C. Russell, "Preliminary Report on Artesian Basins in South-western Idaho and South-eastern Oregon," U.S. Geol. Surv. Water Supply, Paper No. 78, pp. 13, 15, 36, etc., 1903.

§ F. Leverett and others, "Flowing Wells and Municipal Water Supplies in the Southern Portion of the Southern Peninsula of Michigan," U. S. Geol. Surv. Water Supply, Paper No. 182, Ser. O, Underground Waters, 62. 1906.

his report on the flowing wells of Michigan, and by Veatch * who, in a section across Long Island, refers to both artesian and flowing wells.

III. The Run-off of the Darling and Murray.

The first axiom of the water-pressure theory of the flowing wells is that the rivers that flow westward into Central Australia from the East Australian Highlands contain so small a proportion of the rainfall, that most of their water must have sunk underground. This view was due to the estimates of H. C. Russell, that the annual discharge of the Darling river past Bourke is less than 1½ per cent. of the rainfall on its catchment area, and that the annual discharge of the Murray river at a corresponding point is 25 per cent. of its rainfall.

In spite of my high opinion of Russell's work, I felt that the geographical conditions of the Darling and Murray basins rendered his estimates very improbable. I therefore asked the Victorian Water Supply Department whether its elaborate measurements of the discharge of the Murray confirmed Russell's conclusions. I was told that on the contrary his estimates had been completely disproved. I was allowed to take copies of some statistics on the question, but as the volume of the Murray river involved some political interstate questions that were then being warmly contested, it did not seem advisable to publish either the information or its source. So in 1905 I simply denied Russell's estimates and stated that, considering the circumstances, the discharges of the Murray and Darling are not abnormally low, and do not require the assumption of a great loss by percolation. Mr. Pittman in reply maintains the essential accuracy of Russell's estimates, and quotes statistics by McKay to confirm them. According to these figures the Murray, in a period of nine years, discharged a 31 times larger proportion of rainfall than the Darling. The Victorian Water Supply Department is, however, not prepared to accept the figures quoted by Mr. Pittman. They were submitted, though only as mere approximations, to the Interstate Commission on the Murray, of which Mr. McKay was the secretary, and they were rejected by that Commission.

Mr. H. S. Wilkinson, the Secretary of the Murray Waters Commission, has kindly sent me the Monthly Statistics for several years of the discharge of the Darling at Menindie, which, in a straight line, is about 80 miles below Wilcannia (Fig. 2). In spite of being so much lower down the river in a non-contributing area, the run-off in inches over the catchment is always higher than that given by Mr. Pittman for Wilcannia, as shown by the following comparisons:—

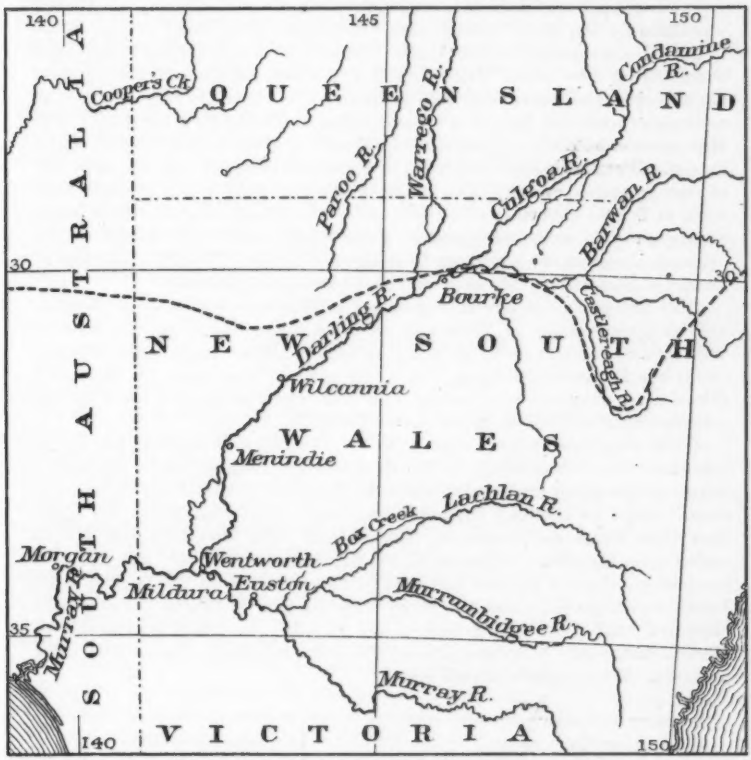
Run-off in inches over catchment—

	At Wilcannia according to figures quoted by Mr. Pittman.	At Menindie according to Mr. Wilkinson.
1894	0·464	—
1895	0·110	0·222
1896	0·161	0·298
1897	0·128	0·248
1898	0·104	0·242
1899	0·051	0·078
1900	0·127	0·233
1901	0·059	0·094
1902	0·001	—

* A. C. Veatch, "Fluctuations of the Water Level in Wells with Special Reference to Long Island, New York," U. S. Geol. Surv. Water Supply, Paper No. 155, Ser. O, Underground Waters, 52, p. 9. 1906.

Even if the accuracy of Mr. Pittman's figures were admitted, they would not prove that the water lost from the Darling fed the flowing wells, for according to his own map (see Fig. 2) the southern edge of the "artesian basin" is at, or a

Sketch Map of the Murray and Darling Rivers showing the position of the gauging stations and the southern border of the Artesian area.



Nat. Scale 1·10,000,000 or 1 Inch = 157·83 Stat. Miles

100 50 0 100 200 300

Statute Miles

Boundary of Artesian Water-bearing basin. ----------

This border has been copied fr. Pittman's Min. Res. N. S. Wales, Map, p. 458.

Fig 2

little south of, Bourke. The loss from the Darling between there and Wilcannia or Wentworth cannot be due to infiltration into the artesian basin; so the comparison between the Darling and the Murray must be made between the locality where the Darling leaves the artesian area near Bourke and a corresponding point upon

the Murray. That comparison is made in the following letter by Mr. A. S. Kenyon, formerly of the Water Supply Department of Victoria and now the Chief Engineer of the Agricultural Department of Victoria, which I am glad to publish as the opinion of one of the most experienced experts on this question :—

"*Re* Mr. Pittman's criticism of your statements about artesian flow in Australia in the 'Dead Heart.' I would like to offer some remarks in one portion—that dealing with river run-offs.

"The original statement as to comparative run offs of the Murray and Darling was made by Mr. H. C. Russell, then Government Astronomer of New South Wales. He on repeated occasions, in his 'Results of Rain, River and Evaporation Observations, New South Wales' (up to 1900), asserted that the Darling river discharged on the average only 1·35 per cent. at Bourke of the rain falling on its catchment, while the Murray river discharged at Euston 29·2 per cent. The Murray river at Euston according to Mr. Russell at times reached 42 per cent. of run-off. Practically half of its basin is non-contributing, so that the absurdity of such figures is evident. Measurements (the records of which I cannot find) made at Bourke showed that the estimate of Mr. Russell was somewhere about a quarter of the truth, while gaugings of the Murray at Mildura showed just the opposite, his estimate being about three times in excess. The actual gaugings at Bourke were, however, I understand, only isolated measurements.

"Mr. Pittman's comparison of gaugings at Wilcannia with those at Morgan, and his ignoring those at Mildura is not much more defensible. The river at Wilcannia drains, technically speaking, an area of 235,000 square miles of which two-thirds is non-contributing. Of course none of the losses by downward filtration over the non-contributing area and only a portion of those on the contributing area could reach the porous beds.

"The Wilcannia gaugings as given by Mr. Pittman were inquired into by the Interstate Royal Commission on the river Murray, 1902, and were rejected as being unreliable and much below the real figure (New South Wales did not put them forward as anything but approximations). That Commission, on which New South Wales was represented, selected three years, 1894, 1896, and 1900, as representing maximum, minimum, and mean years respectively, and from the accepted gaugings at Mildura and Morgan deduced flows for the Darling at its junction with the main stream. From these the flow at Bourke has now been estimated, that point having been chosen as being practically comparable to Mildura with regard to its distance from source, proportion of non-contributing area, etc. The comparisons then are—

	Contributing square miles.	Non-contributing square miles.	Percentage of rainfall discharged.		
			1894 (maximum year).	1896 (minimum year).	1900 (mean year).
Darling river at Bourke ...	75,000	75,000	6	3	4
Murray river at Mildura ...	53,000	53,000	10	4½	6½

"All estimates of areas, of losses, of rainfall, etc., are on the conservative side, that is, any alteration in the above figures would be to increase the Darling percentage and to diminish that of the Murray."

Mr. Pittman remarks that if my conclusions as to Russell's estimates were correct (Clarke Lecture, p. 128) the evidence in favour of the meteoric origin of the artesian water would be seriously discounted. Mr. Kenyon's letter shows that this serious discount must be allowed, for instead of the Murray discharging 21 times, or, as Pittman claims, 31 times, as large a proportion of its rainfall as the Darling, the proportion is less than twice as large. My statements in 1905 ('Dead Heart of Australia,' p. 336) that the Darling discharge had been underestimated by 75 per cent. was nearly correct, as the underestimate was 66 per cent., and that the discharge of the Murray had been overestimated by 300 per cent. was below the mark, for the overestimate was 400 per cent.

The low run-off of the rivers flowing into the interior of Australia can be adequately explained by evaporation. The influence of this factor had been underrated in the early consideration of the origin of the flowing wells, as was clearly recognized by Dr. J. P. Thomson. He remarks, "the great loss sustained to the rainfall and rivers of Australia by evaporation never seems to have entered into the minds of those who have theorized upon the subject of the disappearance of rivers and lakes, and the leakage of artesian water." *

The conditions of western Queensland are exceptionally favourable to evaporation and unfavourable to percolation, and subterranean rivers are not required to explain the low volume of those which flow into the central basin of Australia.

IV. The Loss by Percolation.

(*a*) *The Blythesdale Braystone.*

The second axiom of the water-pressure theory is that the assumed great percolation of water underground on the western slopes of the Queensland hills could be seen taking place. According to Dr. Jack the water passed underground through the Blythesdale Braystone, an intensely bibulous rock, supposed to have a continuous outcrop, at least 1000 miles in length and 5 miles in width. The mean rainfall over the outcrop was represented as 27 inches and the band was said to be traversed by many large streams, which lost their water into it. These estimates, like those of run-off, are, however, inconsistent with the facts. Instead of the Blythesdale Braystone having a continuous outcrop of 1000 miles it consists of a series of isolated outcrops of a total length of only 600 miles.† Moreover, the largest outcrop of the Blythesdale Braystone, which includes 13,840 square miles out of the total of 16,765, is in northern Queensland, and can contribute neither water nor water-pressure to the main area of the flowing wells; for both its surface and subterranean waters, except, perhaps, for a small area at its southern end, would discharge into the Gulf of Carpentaria, as they are separated from the central basin by the ridge of old rocks below Manfred Downs. Further, the surface level of the Blythesdale Braystone at the northern end of this large outcrop is only 100 feet above sea-level.

Instead, moreover, of the Blythesdale Braystone having a rainfall of 27 inches, the map issued by the Queensland Water Supply Department, giving the rainfall to the end of 1906, shows that the northern, non-contributing area of Blythesdale Braystone might have a rainfall of 24 inches; but the two middle areas near

* J. P. Thomson, "The Climate and Artesian Waters of Australia," *Queensland Geogr. Journ.*, vol. 17, p. 26. 1902.

† Exclusive of the areas marked as Blythesdale Braystone near the New South Wales border, as they are now recognized as Lower Mesozoic.

Jericho and Aramac, have a rainfall of only 17·7 inches, and the southern series of outcrops a rainfall of 23·3 inches.

The theory that the flowing wells discharged water taken in through the Blythesdale Braystone relied not on the rainfall upon the outcrop but on numerous powerful streams and rivers that flow across the outcrop.

The most definite statements as to the absorption of streams by the Blythesdale beds are in a paper by Dr. Jack,* in which he quotes a letter from Mr. Maitland as to the reduction in volume of the upper Flinders where it crosses the Blythesdale Braystone. The structure of this district is shown by Mr. Maitland's map, of which the part in question is reproduced as Fig. 10. The rocks mapped as Blythesdale Braystone crossed by the upper tributaries of the Flinders River are, however, now identified as Desert Sandstone; and the general evidence of Mr. Maitland's map suggests that the four areas of sandstone (mapped as Blythesdale Braystone), that outcrop in the gorges of the basalt plateau, discharge in local springs much of the water that has been absorbed.

Dr. Jack further gives a list of ten "large watercourses," which, with the eastern tributaries of the Thomson river, are said to lose "enormous quantities of water" when they cross the Blythesdale Braystone, and, except in flood time, cease to run beyond its outcrop. These streams are as follows:—Blythe's, Bungil, Bungeworgorai and Amby creeks, the Maranoa river, Hoganthulla creek, the Warrego river, Birkhead creek, Torrens creek and the eastern tributaries of the Thomson river. But of these streams, according to the 16 mile to an inch Geological Survey Map of Queensland,† Torrens creek and most of the eastern tributaries of the Thomson river, never touch the Blythesdale Braystone; Figs. 3A—3E, reductions from that map, show that the areas drained by the other streams before they reach the Blythesdale Braystone are all very small. That map shows that the capacity of the Blythesdale Braystone, as a source of supply to the underground beds, has been greatly exaggerated. It shows that there are five chief outcrops of Blythesdale Braystone, excluding those along the New South Wales border now regarded as Lower Mesozoic. The map shows that the Blythesdale Braystone, on the whole, gives rise to about as many streams as it receives, and that most of the streams which reach it carry on to it the drainage of only insignificant areas. For convenience of reference the Blythesdale Braystone outcrops and their relations to the rivers are shown on Figs. 3A—3E; and as far as can be judged from the maps—the best available evidence in the absence of stream gaugings—the Blythesdale Braystone gives more water to the streams than it receives from them.

By far the largest of the outcrops is the northernmost, which includes about 13,840 square miles out of a total of 16,765; but this outcrop, as will be seen by reference to the map (Fig. 3A), must drain almost entirely to the Gulf of Carpentaria, and can contribute very little water, if any, to the flowing wells in the main basin. A few streams, of which the chief are Green creek at the northern end, and the Stawell river at the south, rise to the east of this outcrop and flow on to it; but most of the tributaries of the Stawell, Saxby and Norman rivers actually rise on the Blythesdale Braystone. The position of this large outcrop and its drainage have very little bearing on the feeding of the chief flowing wells.

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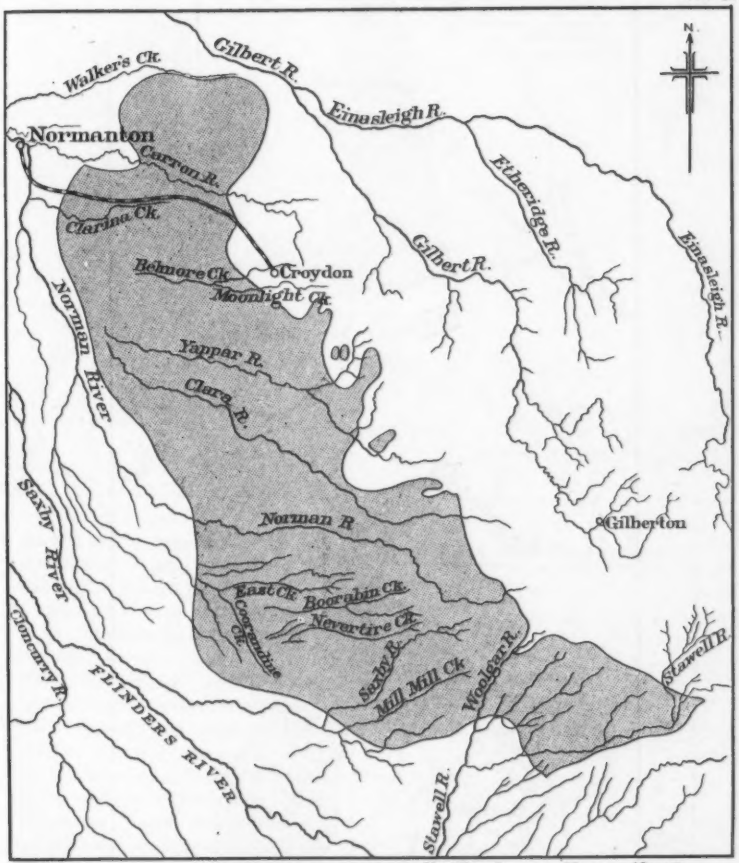
* R. L. Jack, "The Submarine Leakage of Artesian Water," *Proc. R. Soc. Queensland* (1897), vol. **12**, p. 60.

† Later editions have been published on the scale of 40 miles to the inch; but the latest edition of that map I have seen, 1908, makes no alteration in the mapping of the Blythesdale Braystone and its rivers; the 16-inch map is more convenient as it is much clearer.

The next two outcrops are those at Jericho and at Aramac, and they are the supposed intake beds for the important wells around Barcaldine, Longreach, Muttaburra, and thence to Winton. These two outcrops are both comparatively small, having a total area of about 625 square miles; and how little water they

THE NORTHERN OUTCROP.

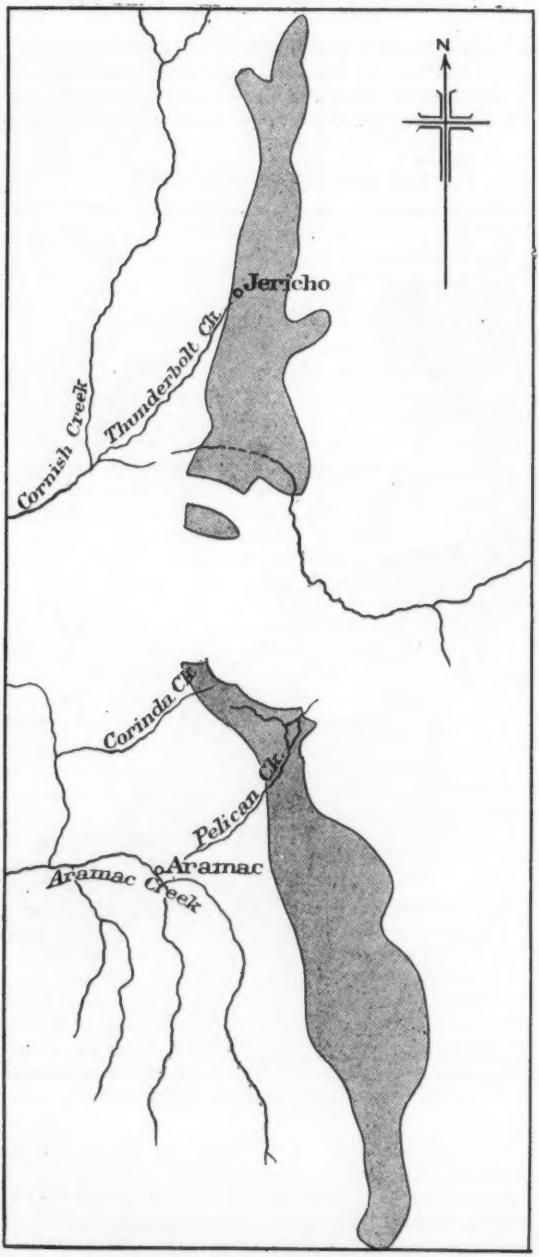
FIG. 3.A



can absorb from streams is shown by the map, Figs. 3B and 3C. The Jericho outcrop gives rise to Thunderbolt creek and is traversed only by Reedy creek; and it is only from this small creek that the Jericho outcrop can absorb water that has fallen to the east. The Aramac outcrop can do even less. Two tributaries of the Corinda creek and the longest tributary of Pelican creek both rise on

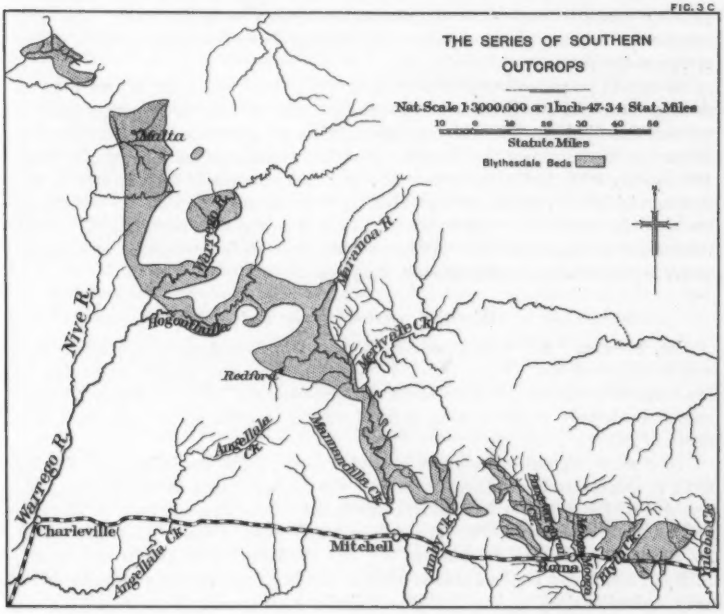
Fig 3 B

The Jericho and Aramac Outcrops.



the Blythesdale Braystone, and only two insignificant streams, which flow into Lake Mueller, rise on the eastern side of the outcrop. The water of Aramac creek

FIG. 3 C.

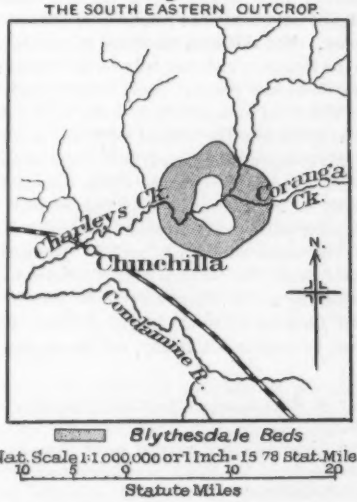


mostly comes from the plains of the Rolling Downs Formation to the west of the Braystone.

The next series of outcrops of the Blythesdale Braystone may be regarded as one group, Fig. 3D. Its various outcrops are traversed by numerous streams which pass from other rocks on to the Blythesdale Braystone, but not one of these is represented as being swallowed up by that formation. The Braystone itself gives rise to almost as many tributaries as flow on to it; and most of those which rise off the Braystone drain very small areas before reaching it. The Warrego, Maranoa, and Merivale creek drain the largest areas before reaching the Braystone; but even these streams are comparatively small, and the mean rainfall

Fig. 3 D

THE SOUTH EASTERN OUTCROP.



at the three stations beside them is 22 inches, 27 inches, and 23 inches, falling on an average of 56, 81 (approximate) and 49 wet days respectively.

The last outcrop of the Blythesdale Braystone (Fig. 3, E) is a small isolated patch crossed by Charley's creek, a tributary of the Condamine river. The rock appears to be thin, for an outcrop of the Rolling Downs formation occurs in the centre of the outcrop.

It should be remembered that even those streams which are represented as flowing on to the Blythesdale Braystone flow only at intervals, so that there is no constant discharge into the formation; that the outcrops of the Blythesdale Braystone are in or near the Tropics; that they stand at elevations ranging from 100 to only 2000 feet above sea-level; and that their rain falls mostly in the summer, in falls of, on an average, about $\frac{1}{2}$ inch per day; so that the conditions are most favourable to evaporation and least favourable to percolation. When these facts are appreciated it will be realized that no large volume of meteoric water is poured into the Blythesdale Braystone.

(*b*) *Other possible Intake Beds.*

Mr. Pittman * has abandoned the Blythesdale Braystone as the intake bed and substituted the "Trias Jura" † Sandstones, which, though extending in Queensland for about 300 miles along the south-eastern border of the well basin, cannot contribute to the flowing wells of central Queensland any rain that falls north of 25⅓° S.

In considering this question it is advisable to divide the basin with flowing wells in Queensland into three sections; the southern area to the south of the line A—B (Fig. 1, p. 37), from the northern end of the Jurassic beds at Boxvale (about 26° S. and 141° E.) to the north-eastern corner of South Australia (about 25° 20′ S., 148° 30′ E.). In this area the only available intake area would, as Mr. Pittman maintains, be the Jurassic beds, as the Blythesdale Braystone has only a very limited outcrop.

The second division, that of Central Queensland, occupies the country between the northern edge of the first division and the line C—D near the buried ridge of old rocks that passes from Cloncurry beneath Manfred Downs to Hughenden. For this area there are no available Jurassic deposits to the east to act as the intake, which can only be the comparatively small outcrops of Blythesdale Braystone and possibly some Desert Sandstone.

The third or northern area lies to the north of the Manfred Downs ridge; it must drain into the Gulf of Carpentaria about Normanton. On the eastern side of this comparatively small part of the area of flowing wells there is a large outcrop of Blythesdale Braystone, which cannot have any influence on the main well basin, as its surface at its northern end where crossed by the Normanton to Croydon railway, is only from 100 to 200 feet above sea-level.

The southern artesian area in Queensland is traversed by a line of accurate levels along the railway from Toowoomba, through Charleville to Cunnamulla. According to Mr. Pittman (Clarke Lecture, p. 127), the Jurassic sandstones rise near Toowoomba to the height of about 2000 feet; but the area at this elevation must be very small, if any, for the downs around Toowoomba are composed of

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* E. F. Pittman, "The Mineral Resources of New South Wales" (1901), pp. 462, 463.

† These beds are referred to as Jurassic in accordance with the palæontological conclusions of Dr. Smith Woodward and Professor Seward and the general trend of recent opinion.

basalts overlying the Jurassic. The sandstone is not met with on the railway going south to Warwick at elevations of above 1500 to 1600 feet; going south-westward it occurs at Petsworth at 1700 feet, and is first seen on the line north-westward to Dalby near Jondaryan, where the railway station is at the level of 1259 feet; on the line to Brisbane it is not met with till below 1600 feet, and the cliff cuts across it down to the level of under 500 feet. The Jurassic sandstone also falls quickly westward, till at the railway station at Dalby, 52 miles from Toowoomba, it is only 1123 feet above sea level. It continues to the north of the railway from Macalister to Baltinglass (Yuleba), and all along this band its southern border cannot be at a level of much over 1000 feet. Moreover, on the southern side of the railway the Jurassic sandstone outcrops along the Condamine river at a level which must be below the height of Chinchilla, 992 feet, as that locality is higher up the valley of the Condamine; while there are probably also considerable areas of the Jurassic sandstone on the Weir and Macintyre rivers, two northern tributaries of the Barwon, where the outcrops, as shown by railway levels on the line to Goondiwindi, are as low as 800 feet. The width of the Jurassic in the north-western part of the outcrop from Taroom to Bendemere is nearly 70 miles, but at least 55 miles of this width is drained to the Pacific by the Dawson river, and it is only a comparatively small band on the southern side, of which the surface drains to the west.

The maps of the Geological Survey of Queensland show that these sandstones are continuous from the summit of the plateau around Toowoomba to the sea. They do not dip regularly westward along the whole of that line, but, as shown by Mr. Cameron's two reports on the Ipswich Goldfield, the rocks are sometimes horizontal and sometimes dip to the east. I therefore referred to the band of this sandstone from Toowoomba to the sea as an outlet. I meant thereby an available outlet, for the wells near Toowoomba and the experience of the Ipswich mines show that there is no large body of water flowing eastward through the sandstone. That, however, merely seems to me due to the conditions being much more favourable to a relatively high run-off over the surface than to percolation through this rock. The Jurassic sandstones between Brisbane and Toowoomba offer an available outlet to the sea, and the fact that the outlet is not used is due to the unsuitability of these rocks for water passage.

The Jurassic sandstones in Queensland are very different in character from the Blythesdale Braystone. I am indebted to Mr. Cameron of the Geological Survey of Queensland for a typical specimen of the Jurassic sandstone from the Brisbane bore, and to Mr. Marks of the Queensland Geological Survey for guidance to some outcrops of these rocks near Brisbane. The exposures that I saw there are of well-cemented compact sandstones, grits, and fine-grained conglomerates with a compact base. As Mr. Cameron remarked of the sample he selected for me, the rock does not look like one with a high water-bearing capacity,* and Dr. J. P. Thomson † estimates that the water-bearing capacity of the intake rock has been overestimated by probably 70 per cent. None of the Queensland Jurassic sandstones which I have seen could be described as a highly bibulous or porous

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* Mr. Pittman quotes the Trias-Jura rock as capable of absorbing 25 per cent. and the Blythesdale Braystone, near Roma, 12½ per cent. of water; so that they are neither, according to these results, especially porous rocks (Pittman and David, "Irrigation Geologically Considered," *Journ. and Trans. R. Soc. N. S. Wales*, vol. 37, 1903, p. cxxxvii.). According to Mr. Pittman, the Desert Sandstone is less porous than the Blythesdale Braystone ('Mineral Resources of New South Wales,' p. 468).

† *Queensland Geographical Journal*, vol. 17, 1902, pp. 23–24.

rock, and these sandstones would not be likely to transmit water pressure or considerable quantities of water to great distances except through the joint planes; and if the rock is traversed by such joints, as Fig. 13, copied from Mr. Pittman, would show, the main area of these sandstones around Toowoomba would discharge much of their water into the deep gorges that cut into them or on the face of the Toowoomba escarpment. Further to the north-west much of the sandstone area would be drained by the Dawson river.

That the sandstones at Toowoomba no more transmit large quantities of water to the west than to the east, is shown by the Dalby well. This well is on the south-western margin of the Jurassic sandstones, 52 miles from Toowoomba; it has a daily flow of only 25,675 gallons ('Henderson's Tables,' 1908, p. 2), although it has been bored for 2500 feet through these sandstones. Its main supply of water came from a bed, 21 feet in thickness, at the depth of 1553 to 1574 feet. As the Jurassic sandstones are therefore poor in water, only 52 miles from Toowoomba, it seems most improbable that they should contribute much to the prolific wells at a much greater distance westward. The Albilbah well passed through a typical Jurassic sandstone, which yielded no water.

According to Mr. Pittman the water-pressure transmitted from the Jurassic sandstone at Toowoomba should be measured from the highest point of that

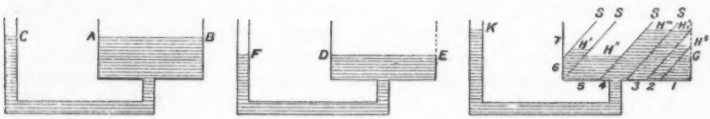

Fig 4.

The Potential Levels in Pipes from Reservoirs with Solid & Perforated Walls. The Reservoir in C is divided transversly by water-tight partitions (S)

formation; whereas the pressure should be reckoned from the lowest point at which water can discharge freely. Thus, if this sandstone were one thick permeable bed, the water-pressure should only be reckoned from the lowest part of the outcrop. If, on the other hand, as is actually the case,* the Jurassic sandstone be an alternation of sandstone and shale, the water pressure for each layer of sandstone should be considered separately and measured from the lowest outcrop of that layer. The maximum height to which the Jurassics rise near Toowoomba affects only the level of the water in the particular bands of sandstone that occur at that height; and only a very small proportion of the water that falls on the Jurassic area has any chance of percolation into those bands. The highest level of the Jurassic formation is either immaterial or affects only a very small proportion of the water.

This question may be illustrated by three figures (Fig. 4, *a*–*c*). The first shows that in the case of a reservoir with water-tight sides the water will rise in a pipe to C, level with the surface of the water, AB, in the reservoir; but if one side of the reservoir be pierced with holes down to the level of D, as in Fig. 4, *b*, then the water above the level DE would escape and the water would only rise in the pipe to the height F. But if the reservoir were divided into compartments by the series of watertight partitions (S), then piercing the side of the reservoir

* See, *e.g.*, section of the Dalby well, 'Henderson's Tables' (1908), Well Sections, No. 208.

to G would only drain the compartments 1, 2, and 3, and would not affect the water-pressure from the others; but the available supply of water and the pressure to the pipe would be only that from the limited section (No. 4) of the reservoir which outcrops at H'''.

The Jurassic sandstones of Queensland would hardly have been adopted as the intake bed for its vast system of flowing wells if the Blythesdale Braystone had not been previously adopted and failed.

It may be said that the Desert Sandstone, which in places overlies the Blythesdale Braystone, may transmit to it large quantities of water; but such contributions are limited by the facts that the western part of the Desert Sandstone rests upon the clays of the Rolling Downs formation and feeds the surface streams that flow over them; and the eastern part is breached by deep valleys which drain it to the Pacific.

That rain percolates readily into the Desert Sandstone is unquestionable. Mr. Pittman * quotes, "as showing the wonderful porosity of some rocks," a letter written by Mr. James Tolson in 1892, that he had "seen 10 inches of rain fall within 24 hours on the high desert country between Uanda and the Cape River Goldfield, and not a drop run off the surface, the whole of it having been absorbed by the porous formation." Ten inches in one day was a heavy storm in a locality between Uanda, where, according to the official records,† the mean annual rainfall is 17·24 inches, with a mean of thirty wet days in a year, and Pentland, in the Cape Goldfield, where the mean rainfall is 24·11 inches, with a mean of forty-five wet days. The maps show so many tributaries of the Thomson river rising on this tract of Desert Sandstone that there seems no need to assume any heavy loss by percolation from it into underlying formations; and as most of the Desert Sandstone of that area is separated from the Braystone by the clays of the Rolling Downs formation, only a small proportion of the water could reach the Braystone.

That the Desert Sandstone is often waterless has been proved by many wells, such as those along the Central Railway between Jericho and Back Creek (see section, Fig. 6, p. 56).

The rocks of the Drummond range include many beds of "gritty sandstones," which are well exposed on the hills, and dip gently westward; they thus present almost ideal conditions for wells flowing by water-pressure. Nevertheless they yield but little water in wells bored through them. These rocks rise to the height of 1717 feet at the gap, by which the railway crosses the Drummond range, and the western outcrop ends at the level of about 1200 feet; yet the water from the beds in the Jericho well rises only to 993 feet.

The Jericho well shows that the broad outcrop of the Drummond range beds, in spite of several favourable conditions, does not pass much water westward to the well basin.

V. The Sources of the Subterranean Water.

(*a*) *The Diminishing Flow.*

If, then, there is no evidence of any considerable percolation into the water-bearing beds at the present day, what is the origin of this subterranean water? I believe it comes from three main sources: (1) plutonic water which has risen

* 'Mineral Resources of New South Wales,' pp. 467–468.

† Rainfall Map of the Water Supply Department of Queensland to the end of 1906.

from below; (2) residual water deposited in the beds at the time of their formation; and (3) some rainfall which percolated into the sandstones at an earlier geological time.

In 1905 I was prepared to admit a fourth source, percolation from rainfall at the present time; but after further study, I fail to see any evidence of any appreciable replenishment of the flowing wells, except perhaps of those near the Gulf of Carpentaria, by contemporary rainfall.

Mr. Pittman represents me as maintaining all the water as plutonic. I thought it was quite clear that I regarded only part of the water as of deep-seated origin.* For instance, I remarked "that the well-waters of Central Australia are *partly* of plutonic origin;" † and that "*much of* the water is probably of plutonic origin;" ‡ and that some was meteoric water is implied by the remark on p. 292, "the conditions are not favourable for *much of* this rain percolating underground."

In 1905 I saw no chance of estimating the relative value of the four sources of supply. As I remarked (*op. cit.*, p. 326), "In what proportion of the area percolation is taking place, it seems at the present time impossible to say." I suspected that the addition to the underground supply from rainfall is small; and a visit last year to central Queensland convinced me that it was even less than I expected. Thus, a variation in the artesian water in Paris, which Mr. Pittman quotes to support the water-pressure theory for the Australian wells, can be recognized there, according to Belgrand,§ a few months after a flood in the rivers crossing the intake beds about 100 miles away. If the outflow from the Australian wells were regulated by the pressure of water in the supposed intake beds to the east, a long-continued drought should in the same way have a recognizable effect in the nearest wells. Mr. Pittman has suggested that the diminution in yield of some wells is due to the drought that devastated parts of Australia in 1902–3. If so, it should have affected the eastern wells before the western; and in wetter seasons the eastern wells might be expected to increase their yields, and those which have stopped to resume their flow.

I accordingly inquired whether any connection had been recognized between variation in rainfall and the discharge or water-level in the wells nearest the outcrop of Blythesdale Braystone, north of the Queensland Central Railway. The owners and managers of the pastoral stations have been carefully on the watch for any indications of such a connection. At Corinda it was once thought that some connection could be recognized; but Mr. Wyatt, the manager of the station, says that further observations dispelled the idea. Hitherto there has been no change in the wells that could be attributed to variations in the rainfall.

This question has excited keen local interest owing to the falling yield and pressure of the wells, many of which have now ceased to flow. My warning of 1905 that the wells should not be allowed to run to waste was based on their probable future diminution; and there has been a fall in yield, which is certainly widespread, though its full range I have not been able to discover. There is a natural reluctance on the part of owners of the wells to admit their partial failure; nevertheless, a diminution in yield seems to be the rule in most parts of Queensland, South Australia, and New South Wales.

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* Mr. Harker, for example, has correctly understood that I regarded the plutonic water as only a part of the supply. A. Harker, 'The Natural History of Igneous Rocks,' 1909, p. 48.

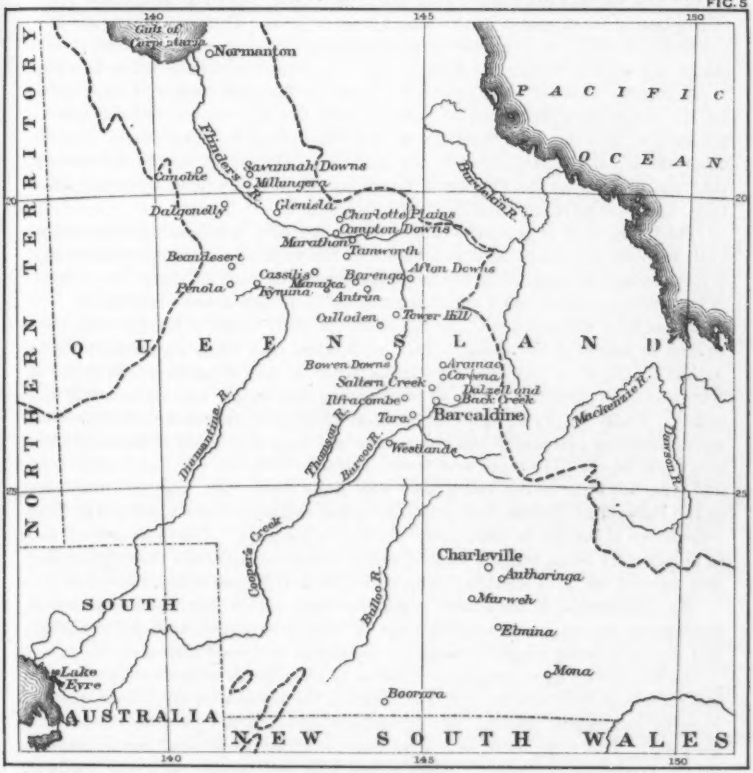
† 'The Dead Heart of Australia,' p. 317.

‡ *Ibid.*, p. 339.

§ Belgrand, 'La Seine. Etudes Hydrologiques,' 1872, pp. 98–101, pl. A.

Mr. Pittman states * that "nearly all" the wells that give diminished flows are on the margin of the basin. This may be true for New South Wales, as the whole area of flowing wells in that state may be described as on the margin of the basin; but that it is not the case for Queensland may be seen by reference to map, Fig. 5, which shows the position of some of the many wells with smaller

SKETCH MAP OF SOME OF THE WELLS IN QUEENSLAND WITH A DIMINISHED FLOW, OR WHICH HAVE CEASED TO FLOW. FIG. 5



yields. That at Winton, for example, is in the very centre of the northern area. That the diminution in flow is not a marginal effect is further shown by the fact that though some of the central wells have diminished, others nearer the margin have maintained their full discharge.

The last report on the wells of Queensland, published by the Water Supply Department of that state, reports fallen yields in a sufficient number of cases to

* 'Clarke Lecture,' p. 137.

show that the change has affected many widely scattered districts. Upon inquiry along the line of the Queensland Central Railway, I was informed that the wells have smaller yields, or have ceased to flow, at Barcaldine, Tara, Saltern Creek, Geera, Corinda, Coreena, etc., etc. At Barcaldine the pressure of the water has fallen from 36 to 16 lbs. At the Delta South bore the pressure has fallen until the flow can now often be stopped by the pressure of the hand. So widespread has been the fall near Barcaldine that Mr. Hanney predicts that a few years hence there will not be a flowing well left in that district. The failure cannot be attributed simply to a diminished supply from the intake beds, for some wells cease while others nearer the supposed intake maintain their yield. Thus the Longreach and Cunnamulla wells flow, I am assured, with undiminished volume and pressure; while others still further west, as at Kynuna and South Australia, have fallen in yield.

A number of deep wells have been sunk on Kynuna station, 4 or 5 miles apart; but after a while they all cease to flow, and Mr. Jowett, the manager of the station, tells me that their life is only from seven to eight years. On the other hand, Mr. Graham Hewett, the clerk of the Paroo Shire Council, tells me that the pressure at the Cunnamulla bore has been determined by gauge since 1898, and that no diminution has been recorded.

The fall in yield of the wells cannot be attributed to the opening of too many wells without the complete abandonment of the view that the present discharge is insignificant in comparison to the replenishment by rainfall, especially as some of the wells that have failed are situated miles from their nearest neighbour.

It has been suggested that the failure of the wells is due to their having been choked by failure of the casing. Such an incident may occur occasionally, as at Arthur's well, where the discharge began again as soon as an obstruction in the bore had been removed. But in many cases this simple explanation will not suffice. Thus, Mr. Fysh, Clerk of the Shire Council at Barcaldine, told me that the diminishing pressure of the bores there had been attributed to some obstruction in the pipes. The pipes were therefore drawn from the well, and though they had been down for eleven years, they were quite clear. Mr. Vance, a well-borer in the Barcaldine district, told me that he had cleared out the pipes at the Tara wells to see if the fall in yield there was due to chokage. The pipes were found to be perfectly clean, but the water-pressure had gone, although the original flow from each of the Tara wells had been about 300,000 gallons a day.

Mr. Henderson, in his annual report for 1898, stated that the diminution in the wells is due to loss of head and not to leakage or obstruction in the casing; and that conclusion seems to me amply confirmed by later evidence.

At the Government Irrigation Station in New South Wales the fall in yield was so serious that another well was bored in the belief that the failure was due to some mechanical defect; but the second bore did not produce the original quantity. This experience is a significant contrast to that of South Dakota, where, according to Darton,* when a well fails and another is bored beside it, the second usually secures the full original flow and pressure of the first.

The partial or complete failure of the wells in some areas cannot be due to drought on the supposed intake area, † or the eastern wells would have been

* N. H. Darton, 'Preliminary Report on the Geology and Underground Water Resources of the Central Great Plains.' Dept. of the Interior, U.S. Geol. Surv. (1905), Prof. Papers, No. 32, p. 195.

† This view has been suggested by Mr. Pittman, but it has been rejected by M. P. Privat-Deschanel, owing to the irregular distribution of the wells with reduced yields ("La Question de l'Eau dans le Bassin du Murray," *Ann. Géogr.*, *Ann.* xvii., July, 1908, p. 315). M. Privat-Deschanel concludes, "contrairement à ce qu'enseigne la théorie" that the water comes from several and not one subterranean sheet.

affected first, the change would have extended slowly westward, and the wells should have increased their discharge in the years of heavier rainfall following the drought of 1902–3.

(*b*) *Meteoric Water due to Ancient Infiltration.*

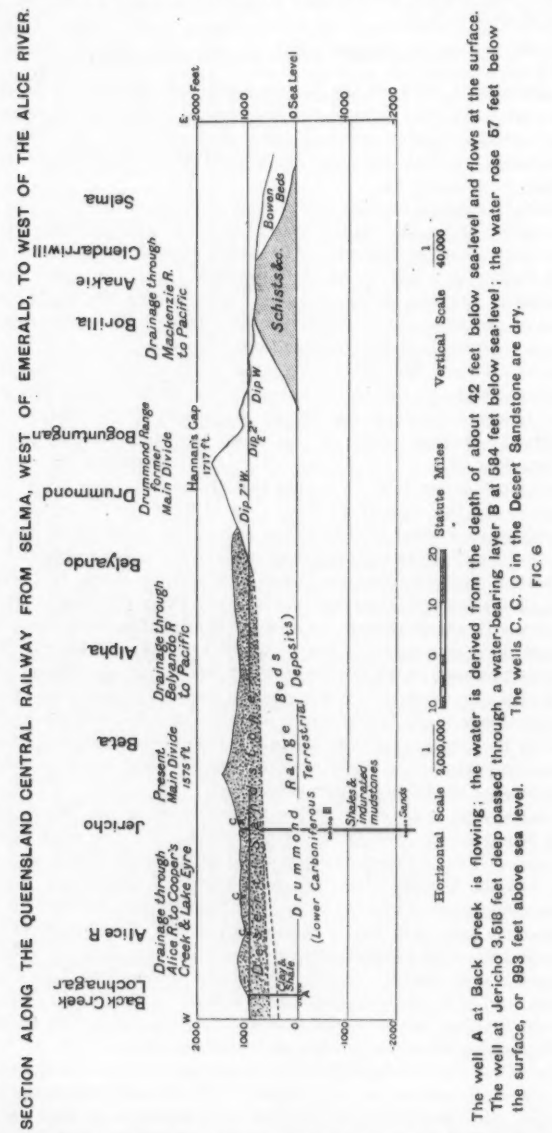
The Queensland wells on the eastern border of the area of flowing wells show no variations that indicate the influence of their replenishment by contemporary rainfall. Nevertheless, I think that much of the water was of meteoric origin, but that it reached the present water-bearing layers at a much earlier time.

Southern Queensland consists of two main geographical areas; in the interior there is a high plateau, that sinks westward by a long gradual slope, down which the rivers flow in shallow channels. The eastern edge of this plateau is separated from the Pacific by a belt of intensely dissected highlands, which include the chief mountain summits of Queensland. These Eastern Highlands are mainly composed of palæozoic rocks, which are often much folded and faulted. The chief rivers of Queensland flow through deep valleys, which have been cut backward into the Eastern Highlands; and as the rivers worked their way westward, they captured many of the head streams of the rivers flowing inland. Thus, along the Tropic of Capricorn (see Fig. 6), the present divide between the inland and the Pacific drainage occurs on the Desert Sandstone plateau at the height of 1575 feet, near Beta, east of Jericho. The Desert Sandstone, however, extends for 42 miles further eastward, to 4 miles east of Pinehill; over it flow numerous tributaries of the Belyando river, the waters of which flowed inland, when the Drummond range, crossed by the railway at the level of 1575 feet, was the main divide. Outliers of the Desert Sandstone occur even further to the east, forming the Expedition range between the Comet river and the Black Boy creek and a dissected plateau between Duaringa (274 feet) and Dingo (372 feet). The eastern outliers of the Desert Sandstone are on a lower level than those along the main divide, and they have probably been lowered by later subsidences. The most obvious interpretation of the physiography of this part of Queensland is that the western plains once extended much further to the east, so that some of the rivers that now discharge to the Pacific flowed down the western slope into the interior. The country thus transferred from the inland to the coastal drainage, being near the ocean, probably had a larger rainfall than the land which now forms the western border of the basin of internal drainage.

The subsidences which lowered the eastern areas of the Desert Sandstone probably happened in geologically recent times; for the most conspicuous features seen in a traverse across Queensland from Rockhampton to Longreach indicate that the Eastern Highlands have undergone important geographical changes at a comparatively recent date. The Belyando has captured the drainage of a large area that once flowed westward into the Thomson river; further south the Dawson river has probably captured the drainage of the whole district to the east of Mount Hutton, forming the counties of Aberdeen, Labouchere, and Fortescue; and it is probably only the resistance of the basalt sheets around Toowoomba that has prevented the Brisbane river cutting its way further westward and annexing the upper tributaries of the Condamine.

If this view of the development of the river system of eastern Queensland be correct, the small streams that now cross the Blythesdale Braystone, were once much larger, and the percolation into the water-bearing beds that underlie the western plain would have been greater than is now possible. I suspected these facts before 1905, but, in the absence of a sufficiently definite orographic map, I did

not advance this hypothesis. Traverse of the country in 1909, however, left



The well A at Back Creek is flowing; the water is derived from the depth of about 42 feet below sea-level and flows at the surface. The well at Jericho 3,518 feet deep passed through a water-bearing layer B at 584 feet below sea-level; the water rose 57 feet below the surface, or 993 feet above sea level. The wells C, C, C in the Desert Sandstone are dry.

FIG. 6

me with no doubt that there has been extensive capture of the internal drainage by the eastern rivers, and that this process is still in progress. Hence rain,

which would formerly have run westward, now flows eastward to the Pacific, and so has no chance of feeding the flowing wells; and the beds that supply them probably contain large stores of water derived from prehistoric rainfall, which fell when the high plains of Queensland extended further east than they do now.

(c) *Residual Water.*

The second element in the supply is residual water left in the rocks at their formation. Some of the water-bearing layers are interstratified in the Rolling Downs Formation, which is a series of Cretaceous marine deposits; and the Blythesdale Braystone, the bed accepted as the chief intake by Dr. R. L. Jack and Mr. J. Baillie Henderson, who first applied the hydrostatic theory to the Queensland wells, was also marine in origin. The average chemical composition of the water from the flowing wells does not agree with that of recent sea-water; and that fact might be thought to indicate that the quantity of residual water in the marine rocks is comparatively small. It should, however, be remembered that the residual water would have been mixed with meteoric and plutonic supplies; that some of it comes from beds of terrestrial origin, in which the waters would contain more carbonates than are present in sea-water; and that under the conditions under which the water has been lying since Cretaceous times, it would probably have undergone considerable chemical change. Some of the sodium chloride may, in the presence of the accompanying pyrites and organic matter, have been converted into carbonate, by the reaction used in the commercial manufacture of carbonate of soda.

A large proportion of water is included in most aqueous rocks at their deposition; the amount may be learnt from the last of the remarkable series of papers by the late H. C. Sorby.* He determined the volume of the interspaces in various rocks at their first formation. He showed that the interspaces in sands, for example, would amount to 47 per cent. if the grains were uniform in size, but would be less in a mixture of coarse and fine sand. Sorby, however, never obtained by experiment as low as 16 per cent. of interspaces.† By well shaking rough mixtures of coarse and fine sand the interspaces amounted to 32 per cent., which he could reduce to 28·9 per cent. by well shaking a careful mixture of equal quantities of the two sands. The average result of his experiments with well-shaken sand of uniform grain was 40 per cent. of pore space; if not shaken, the average was 47 per cent. Chalk, according to Sorby, was originally an imperfect mud, which he estimates would have contained more than 70 per cent. of interspaces, and he concludes that the natural chalk has been reduced to 45 per cent. of its original thickness.‡ Shales have undergone an even greater reduction from their original thickness, owing to the gradual obliteration of the interspaces by pressure. Sorby estimates § that in some of the shales of the coal-measures, the beds now occupy only one-sixth of their original volume.

Sorby therefore concludes ‖ that in the case of a sandstone having 46 per cent. of cavities, which had contracted till the grains were closely packed, the contraction would amount to a quarter of the volume or even more if the sand consisted of grains of extremely variable size. In fine-grained rocks, on the other hand, the contraction may be much greater and cause the rock to shrink to a ninth of its original volume.

Sorby ‖ concludes that rock material may contain 90 per cent. of water, even

* H. C. Sorby, "On the Application of the Quantitative Methods to the Study of the Structure and History of Rocks," *Quart. Journ. Geol. Soc.*, vol. **64**, 1908, pp. 171–232, pl. 14–18.

† *Ibid.*, p. 202. ‡ *Ibid.*, p. 213. § *Ibid.*, p. 213. ‖ *Ibid.*, p. 214.

after standing for a year without further subsidence; and this residual water may be slowly discharged through springs or wells.

(d) Plutonic Water.

The third source of water is plutonic in origin. Dr. Malcolm MacLaren * suggests that there is no plutonic water in the area, because none has been recognized in certain mines in eastern Queensland. But that there are geysers, hot springs and mineral waters along the Eastern Highlands of Australia is universally admitted.† Mr. Pittman, for example, remarks in the Mineral Resources of New South Wales (p. 448) that "Mineral springs are fairly numerous in New South Wales." In Queensland there are hot springs at Herberton and geysers on the Einasleigh river, 16 miles from Mount Garnet. The sites of some of these springs were once covered by the eastward extension of the Rolling Downs Formation; and their water would have been discharged into any porous beds beneath or interstratified with the clays; and it would have accumulated in such layers under high pressure. Water is probably still being discharged under the vast plains of western Queensland into the sandstones, from which it will escape in flowing wells when tapped by a bore.

The quantity of the plutonic water is probably incalculable; its amount may be smaller than its influence, but in at least some parts of Queensland it seems to be an important element in the supply. The importance of the plutonic or juvenile water is that it contributes largely to the power which uplifts the water to the surface. The high temperatures of some of the well waters seem inconsistent with their meteoric origin; for unless the temperature gradient be abnormally low in central Australia these well waters must rise from a depth far lower than the bottom of the wells. It would therefore be necessary to assume that the water on its way from the eastern intake beds has passed down to a depth probably twice as deep as the bottom of the wells. This involves an additional improbability to the hydrostatic theory. Meteoric water would not be expected to reach a temperature of 208° Fahr. at a less depth than 8000 feet. Mr. Pittman refers to the uncertainty as to the temperature gradient, but the tendency of recent work has been in favour of lowering the temperature gradient instead of increasing it. The standard geothermic gradient used to be 1° Fahr. for every 50 or 53 feet of descent; but some recent estimates make it 1° Fahr. for every 80 feet. There certainly seems no reason why in Australia it should be as high as 1° for 22 feet.‡

I. C. Russell suggests in reference to the artesian wells of Idaho that any water having a temperature of over 100° Fahr. is probably of deep seated and not of meteoric origin. Mr. Pittman objects that the Australian waters are not plutonic because their temperature is never actually at the boiling point. The waters of hot springs are cooled during their ascent to the surface by contact

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* *Geol. Mag.*, 1907, p. 479.

† In reference to this question Dr. M. MacLaren (*Geol. Mag.*, 1906, pp. 512–513) claimed that the cessation of the great Waimangu geyser in New Zealand, when Lake Rotomahana was lowered by the bursting of its dam, is a proof that the geyser water was of meteoric origin. The fact merely proves that the lowering of the water-level in the area reduced the pressure, which previously caused the water to escape in explosive eruptions instead of as a continuous flow. It certainly does not prove that the steam issuing from the New Zealand volcanic area is of meteoric origin.

‡ This difficulty in the meteoric origin of the water has been remarked by C. J. R. Williams, "The Artesian System of Western Queensland," *Min. Proc. Inst. Civ. Eng.*, vol. 159, p. 319, 1905.

with the rocks by which they pass and are usually less than 212° at their outflow. The highest temperature recorded by I. C. Russell * for the plutonic water in Idaho is 198½° Fahr., whereas temperatures of 198° occur in Queensland at Kynuna and Eromango, Bore No. 2; and at Elderslie, west-north-west of Winton, the temperature is 202°.†

(*To be continued.*)

ADMIRALTY SURVEYS DURING THE YEAR 1910.

UNDER the orders of the Lords Commissioners of the Admiralty, ten of His Majesty's vessels and two hired vessels, manned by 93 officers and 913 men, have been employed on hydrographical surveys at home and abroad.

The Marine Survey of India, in charge of an officer of the Royal Indian Marine, has been continued, as in previous years.

A detailed report of Admiralty Surveys has been drawn up and presented to Parliament. The following is a brief summary:—

During the year 1910, as many as 378 rocks and shoals dangerous to navigation have been discovered. During the same period 868 miles of coast-line have been charted; and an area of 14,425 square miles has been sounded over by H.M. surveying vessels.

On the *South Coast of England*, examinations were made of various shoal places off the coast, between Christchurch and Torbay; of areas within the harbours of Plymouth and Portsmouth, and in the approaches to the latter; and Sandown bay, Isle of Wight, was re-sounded.

On the *East Coast of England*, the survey of the lower portion of the river Humber was completed; re-examination was made of some of the channels at the mouth of the Thames; portions of Dover harbour, and of Medway bar and river, were re-sounded; and a survey was made of a portion of the river Stour. In the North sea, an area of 277 square miles was sounded out to the southward of, and including, the southern portion of the Broken and Swarte banks.

On the *East Coast of Scotland*, surveys of St. Andrews bay and of Dornoch Firth, together with the coast between Tarbetness and Cromarty Firth were partially completed; and an examination was made of the Skate bank, Inverness Firth.

On the *West Coast of Scotland*, Loch Boisdale, South Uist, Hebrides, was surveyed; examinations were made of:—the entrance to Loch Hamanavay; an area westward of Scarpa inland; the Tarbert bank, Jura; Castle bay, Barra; the channel south of Burnt isles, Kyles of Bute; and of shoal spots near the entrances to Lochs Inchard and Laxford.

On the *West Coast of Ireland*, Berehaven harbour was partially re-surveyed.

On the *Coast of British Columbia*, a survey was made of the northern portion of the Strait of Georgia, including Malaspina strait, with plans of: Baker passage, Hernando island; Blubber bay, Texada island; Marble bay and Van Anda cove; Pender harbour; and Welcome passage.

On the *Coast of British North Borneo*, on the north-west coast, the survey was continued from the parallel of White rocks to Sanpanmangio point. On

* I. C. Russell, "Preliminary Report on Artesian Basins in South-western Idaho and South-eastern Oregon," U.S. Geol. Surv. Water-Supply and Irrigation Paper, No. 78, Washington, p. 28. 1903.

† 'Henderson's Tables,' p. 18. 1908.

the east coast, the survey of Cowie bay was completed; and plans were made of Saodan, Simatahan, and Serudong rivers; and of Sandakan harbour.

On the *West Coast of Africa*, a plan was made of Sekondi bay; and the plan of King Wills bay was completed.

On the *South and South-East Coasts of Africa*, the approaches to Table bay; and a portion of the Natal coast, from Cape St. Lucia to Durnford point were surveyed.

In the *Straits Settlements*, on the west coast of the Malay Peninsula, a survey was carried out from Pulo Terutau to Pulo Mulun. On the south coast, the western portion of Singapore strait, between Tanjong Kampong and Tanjong Pinjura was surveyed.

In the *Solomon islands*, a survey was made of a portion of the north coast of Guadalcanar island, and the waters between that island and Florida island.

On the *East Coast of Australia*, a survey was carried out of the inner route, Queensland Barrier reef, from Cooper point to Gladys inlet.

On the *North-west Coast of Australia*, surveys were made of the entrance to King sound; and of the coast from Cape Leveque to James Price point.

On the *Coast of Newfoundland*, an area was sounded out across the Gulf of St. Lawrence, between Bonne bay and the Mekattina islands; and the survey of St. John's bay was completed. On the east coast, a survey from Cape Bauld to the southward was commenced; and in addition, lines of soundings 200 miles to the eastward of Newfoundland were undertaken.

The Marine Survey of India for 1910 includes the completion of the Burma coast survey from White point to 14° 35′ N. lat.; and the mouths of the Irrawaddy to 95° 10′ E. long. On the west coast of India, a survey of Nerbudda river, Gulf of Cambay; and the coast survey from Viziadrug to the entrance of Tadri river.

During the year the Hydrographic Department has published 45 new charts, and 490 new editions of charts; 33 plates have been improved by the addition of 46 new plans; 122 worn plates have been improved by being wholly or partially re-engraved; and 8500 corrections have been made to the plates by the engraver.

The number of charts printed for the Government and the general public during the year amounted to 504,231; whilst 1809 Notices to Mariners have been issued.

KRÜMMEL'S OCEANOGRAPHY.

By HUGH ROBERT MILL, D.Sc.

THE standard work on oceanography has long been the book in Ratzel's library of geographical handbooks, of which the first volume by Prof. Georg von Boguslawski appeared in 1884, and the second by Prof. Otto Krümmel in 1887. Both volumes had practically passed out of date, and the time is fully ripe for the appearance in the new series of the handbooks, now under the general editorship of Prof. Penck, of what is in effect an entirely new work by Prof. Krümmel,* though it is modestly called a second edition. The *format* of the

* 'Handbuch der Ozeanographie.' Von Dr. Otto Krümmel. Band I. "Die räumlichen, chemischen und physikalischen Verhältnisse des Meeres." 1907. Band II. "Die Bewegungsformen des Meeres." 1911. Stuttgart: J. Engelhorns Nachf.

volumes has been changed and made more worthy of the high standing of the writers and the reputation of the series, while the growth of the science of oceanography in the last quarter-century is indicated by the second edition containing twice as much matter as the first.

Prof. Krümmel is probably the only geographer who has kept abreast of the flowing tide of oceanographical literature, and how thoroughly he has done this his periodical summaries of recent advances in Wagner's *Geographisches Jahrbuch* have abundantly attested. His close connection with the oceanographical workers of every country in Europe enables him to take wide views, and one of the most conspicuous features of these volumes is the impartial justice he does to the labours of investigators of all nationalities. In his preface to the first volume he refers to the enormous advance in the data during the last twenty years, and to the remarkable increase in the precision in all the observations. The facts as now known demand so much space that Prof. Krümmel regrets the necessity of curtailing the historical notices, to supplement which he refers the reader to Sir John Murray's classical memoir in the concluding volume of the '*Challenger* Reports.' Nevertheless, the historical notes prefixed to the various sections are full of interest and freshness, their conciseness making them only the more effective. He explains that in preparing the book he kept in mind that he was writing as a geographer for geographers.

Volume 1 deals with the size, boundaries, and subdivisions of the oceans, the nature of the water which fills them, the configuration of their beds, the deposits, the distribution of temperature and salinity, and sea-ice. The whole subject of dynamical oceanography, including waves, tides, and oceanic circulation, is dealt with in volume 2.

The treatment of the classification of seas is a fair sample of the author's comprehensive and impartial method. He describes six different systems of classification—by position, by size, by form, by salinity, by circulation, and by origin—each having its own special usefulness. He points out that the classification of geographical forms cannot be carried out on similiar lines to the species or genera or even the orders of natural history, for there is as a rule only one individual of a geographical species, and that individual must be viewed from many different sides. Nevertheless, some natural order of classification may be hoped for, and Prof. Krümmel has prepared one which he hopes may present at least a first approximation to a final system, and this is worthy of quotation.

I. Oceans.—These are independent on account of their size, their general salinity, their peculiar and powerful system of tidal waves and currents; they originated in the most extensive and deepest depressions of the Earth's crust which have been permanent since Mesozoic times. They are (1) the Pacific; (2) the Atlantic; (3) the Indian ocean.

II. Seas (*Nebenmeere*).—These are dependent divisions on account of their small size, receiving their sea-water at second hand and much influenced by land water, subject to reduced tidal waves and currents derived from the ocean, owing their origin to local depressions of the crust not entering deeply into the continental mass, in the geological sense of ephemeral duration, usually very recent, and often post-Glacial.

A. Enclosed seas (*Mittelmeere*).

(*a*) Intercontinental enclosed seas lying between two continents: (1) the Arctic; (2) the Australo-Asiatic; (3) the American (Caribbean); (4) The Roman (Mediterranean).

(*b*) Intracontinental enclosed seas, relatively small, running into the land with only one access to the ocean.

α. Shallow fresh enclosed seas of high latitudes with surface water flowing out to the ocean: (1) the Baltic; (2) Hudson bay.

β. Deep salt enclosed seas of lower latitudes with the surface water flowing in from the ocean: (1) Red sea; (2) Persian gulf.

B. Fringing seas (*Randmeere*).

(*a*) Longitudinal fringing seas, the outline and isobaths of which are parallel to the main dislocation lines of the neighbouring land masses; (1) Bering sea; (2) Sea of Okhotsk; (3) Japan sea; (4) East China sea; (5) Andaman sea; (6) Gulf of California.

(*b*) Transverse fringing seas, the main lines of which are transverse to those of the neighbouring land: (1) The German sea (North sea); (2) The British sea (Irish sea); (3) The Gulf of St. Lawrence; (4) Bass strait.

This example is a fair type of the logical classification which characterizes the whole work, and if we were to venture to criticize the method of presenting the subject it would be by suggesting that in some instances the ramifications of subdivisions are carried rather farther than is necessary. We must, however, recognize that a too severe systematization is better in a scientific work than anything approaching to vagueness or slovenliness of grouping.

In the classification of deep-sea deposits Prof. Krümmel quotes Sir John Murray's well-known double classification into Pelagic and Terrigenous with the cross-classification according to the depth of the sea in which the deposit is formed; but he gives the preference to a new classification into more numerous groups with less familiar names. Thus he recognizes three great groups of deposits: *Littoral*, divided into shore and shelf deposits; *Hemipelagic*, including Blue, Green, and Calcareous sands and muds; and *Eupelagic*, or those deposits which are formed far from land, divided into—A, Epilophic formations, divided into Calcareous oozes, including Globigerina and Pteropod ooze, and Silicious oozes, including Diatom ooze; B, Abyssal formations, including Red clay and Radiolarian ooze. After all, there is here only a slight re-arrangement of Murray and Renard's grouping, the essential dividing lines of proximity to land and depth of water being preserved.

Objection has been made more than once in England that the discussion of the deposits and of the salinity of the ocean is not a legitimate concern of geographers; but we consider that Prof. Kümmel's handling of these matters amply justifies the position taken up thirty years ago by Sir John Murray and Mr. J. Y. Buchanan, and it is a curious though perhaps a characteristic circumstance that in no country has the geographical bearing of such researches been contested, save in our own, where this important branch of physical geography was introduced and brought to perfection. Although Krümmel marshals a vastly larger array of facts than Murray and Buchanan could command, his results are merely expansions of theirs; and, as we have indicated as a general characteristic of his work, the fullest credit and honour are given to the first masters of the science of the sea. The line must be drawn somewhere, and whereas Sir John Murray would probably treat at length of the formation of coral islands in a treatise on oceanography, tracing their origin to the same causes as produce deep-sea deposits and the chemical changes of sea-water, Prof. Krümmel leaves this large question out of account, fully as he deals with other matters of a similar kind.

While volume 1 contains little that is unfamiliar to those who have followed

the progress of oceanography in the scientific journals of London and Edinburgh, volume 2 gives in scientific form the facts which in English must be sought for chiefly in official publications of the Hydrographic Department of the Admiralty and in Sailing Directions, or in papers by physicists and mathematicians read to various learned societies. It is divided into three great "chapters" dealing respectively with waves, tides, and currents, and each subdivided and redivided with systematic thoroughness. The treatment of the tides in the various oceans and seas is completely new, and although the irregularities of the tidal phases and amplitude cannot yet be fully explained, Prof. Krümmel is thoroughly persuaded that the key is to be found in geographical considerations, mainly in the configuration of the respective basins. A notable advance in the treatment of ocean currents consists in the simultaneous consideration of horizontal and vertical movements, dealing with the circulation of the ocean as a whole, and the various theories of the cause of this circulation are fairly discussed. It is in the second volume rather than the first that we see the importance of the geographical standpoint adopted by the author, for here he has restated the work of the physicists and mathematicians who have investigated the facts, and puts it forward in a form specially designed for geographers.

The volumes are illustrated freely with diagrams and diagrammatic charts representing details not to be found even in German physical atlases; but there is no attempt to give such maps of ocean depths or currents as have now become common in our school atlases. Prof. Krümmel says that if he had acceded to the wishes of many friends he should have produced a great atlas of oceanography as a companion to his book, which would be quite out of place in the series to which that belongs. Such an atlas remains a great desideratum, and without something of the kind it is difficult to appreciate to the full the remarkable compendium of information regarding the oceans which these volumes present. Although a compendium, Krümmel's 'Oceanography' is not a mere huddle of facts, but an array marshalled by science, the ranks defined by many judicious omissions to which the bibliographical footnotes furnish an admirable index. To have acted otherwise and striven after absolute completeness of statement would, as the author well puts it, have been to place registration instead of science on the throne.

REVIEWS.

EUROPE.

'The Building of the British Isles.' By A. J. Jukes-Brown. (3rd edit. London: Stanford. 1911. Pp. xv., 470. *Maps and Illustrations.*) A change of publishers and the addition of over half a hundred illustrations are the chief superficial alterations in the third edition of this well-known work. The extension and rewriting which the text has undergone are so considerable that in many respects the book may be considered to be a new work. In the preface the author speaks of rewriting every chapter. To many students unversed in field-work the series of restoration maps at various periods will prove even more impressive, in respect of the wonder and immensity of the changes in the Earth's surface, than even the inspection of a denuded land surface or of flexured strata. The gratitude of geographical students is due to author and

publishers for the reissue of this work, which has long been somewhat difficult to obtain.

'The Danger Zone of Europe.' By H. C. Woods. (London: Fisher Unwin. 1811. Pp. 328., *Map and Illustrations.* 10*s.* 6*d.*) Lest there should be two opinions, the danger-zone may be stated to be the Balkan region. The writer is well acquainted with this region, and has among other localities visited Crete and parts of Asia Minor. The whole work hangs upon the present constitutional movement in Turkey, and its whole bent is political; only here and there topographical notes are involved, as when the Bagdad railway and the system of lines in Bulgaria are discussed. The author brings special knowledge to bear upon the Turkish and Grecian armies, and discusses with equal facility the kindred but widely diverse topics of the Cretan, Bulgarian, Albanian, and Armenian questions. His photographs (principally town scenes, military subjects, and persons) are good. The maps suffice.

'Finland To-day.' By G. Renwick. (London: Fisher Unwin, 1911. Pp. xii., 348. *Map and Illustrations.* 10*s.* 6*d.*) This general study is worthy of the notice of any who are interested in, and especially those who contemplate visiting, the grand duchy. The descriptive chapters, though cast in the form of personal narrative, are made as informative as possible for intending travellers, and an appendix adds details. The people and their arts are dealt with in a way which shows the author to have studied them deeply; in this connection it must be supposed that the various lapses in the printing of Swedish words are escaped errors of printing. The history of the country is briefly sketched, and the present political situation is considered both by the author and by Mr. H. W. Nevinson in a preface. Considering the book geographically, it may be gathered that, while scenery interests the author, physiography does not.

'Cliff Castles and Cave Dwellings of Europe.' By S. Baring Gould. (London: Seeley. 1911. Pp. 324. *Illustrations.* 12*s.* 6*d.*) This title suggests an excursion in the prehistoric past; in point of fact, this is confined to the first chapter. For the rest the writer brings all the attraction and facility of his well-known style to bear upon such topics as the modern inhabitants of caves (in various parts of France, Italy, Russia, and elsewhere, as well as the midlands and other parts of Great Britain), on souterrains, and on the great castles which crown or cling to so many cliffs in Germany and other European countries. Several chapters are devoted to the religious uses of caves, whether as churches, hermitages, oracles, or sepulchres, and there is also a chapter on their use as the retreat of robbers. It should be added that the author has pursued his researches to some extent outside Europe, as we find more than one reference to sites in Palestine and Egypt.

ASIA.

Indian Survey.

'Extracts from the Narrative Reports of Officers of the Survey of India for the Season 1908–09.'

This volume contains much useful but exceedingly dull reading. The chief interest to the lay student of the widespread operations of the Indian Survey lies in its topographical and exploratory efforts. Of this there is nothing to be found in this report. It deals only with magnetic, tidal and levelling, pendulum, and triangulation work, and confines itself almost entirely to tabular statistics of the results of observations. Practically there is no narrative. But then the report only professes to produce extracts, and the extracts are mostly tables of

figures which to the uninitiated carry a conviction of immense labour or pains-taking care (especially on the part of the editor), but no lucid understanding of the nature of those practical results which are to be derived from them.

One interesting feature on the magnetic work was the comparison of the Dehra Dun standards with instruments belonging to the Carnegie Institute, Washington, U.S.A. Mr. Somers, of the Carnegie Institute of Terrestrial Magnetism, made a series of observations whilst travelling from Pekin to Kashmir, and was able to compare his instruments with the standards of the Indian Survey. The magnetometers were found to be in close agreement. Comparisons for declination and horizontal force were also fairly satisfactory in their indications. It is hoped that the Carnegie instruments will again be compared at Kew, which will incidentally settle the relation between the instruments at Kew and Dehra. In the "tidal and levelling" section of the report a table is given, showing that tidal observations have been registered at forty-two stations since the commencement of the work in 1874, of which about a dozen are still in active operation, a new station having been started at Moulmein. The tables of errors in prediction of the times and heights of high and low water are quite instructive. As a rule, these errors are comparatively insignificant, amounting to an average of two or three minutes in time or a few inches in height; but there are certainly indications of something wrong with the records at Kidderpore and Chittagong.

One thousand and eighty-five miles of levelling "of precision" was the outturn of three detachments for the season, the results of which, as correcting the height values of trigonometrical stations, are sufficient to remind us of the foolishness of entering the heights of the natural features of the Indian hills and plains by figures expressed in units. It is also interesting to note that lines of precise levelling were carried to certain Himalayan stations, apparently for the first time.

Pendulum observations for the determination of the force of gravity locally and its effect in diverting the plumb-line are carried out in India with a degree of precision and completeness which should render the results of these observations infinitely useful to those in whose hands it lies to initiate a system of geodetic survey over countries hitherto unsurveyed. It is not only the indications which they furnish of the varying attraction of matter both above and below sea-level, and the consequent deflection of the plumb-line, but the conditions of density which exist below the surface of the Earth's crust, which are so valuable in the practical realms of scientific research. No startling discoveries are recorded; there is not even a general summary of results of observations over a local area; the record is rather one of "patient continuance in well doing" than of remarkable developments. This is the most interesting section of the report under review. A comparison is drawn between the character of the geological formations in the peninsula and the extra-peninsula regions of India. Their dissimilarity is clearly shown, and in the words of the author of the narrative report (Captain Cowie, R.E.), it is this variety of character which "constitutes one of the most attractive features of gravimetric research in India, giving rise to problems of much interest as to whether the crust in peninsular India has arrived at a condition of isostasy; whether this condition has been affected by great denudation of the surface; whether the attaining such a condition in the extra-peninsular area has been assisted or retarded by the great crustal movements which have taken place there."

Progress in geodetic triangulation has been divided between Baluchistan and Burma, where (in Baluchistan) triangulation was carried out westward to

the Persian frontier, resting finally on the historic peak of Koli-i-Malik Siah; whilst in Burma the extension of the Salween series southwards was resumed. With the advance of our transfrontier surveys into Persia, the final determination of the value of points fixed by first-class triangulation, which have hitherto been accepted as determined by geographic surveys only, is a matter of immense interest to those who were first engaged in mapping those remote regions. Incidentally, it points also to the growth of more settled political conditions which render such a work possible. In addition to these two series of the first class in triangulation, secondary work of a similar nature has been applied to parts of Kashmir and the Punjab, so that the sum total of the outturn of the more scientific branch of the Indian Survey (which is practically all that this report deals with) redounds as happily as usual to the credit of all concerned; especially to the able and energetic control of Colonel Burrard, R.E., who directs it.

T. H. H.

'Among Indian Rajahs and Ryots.' By Sir Andrew Fraser. (London: Seeley. 1911. Pp. xv., 368. *Map and Illustrations.* 18*s.*) Sir A. Fraser bases his recollections upon thirty-seven years' service. His chapters are rather in the nature of a collection of essays than of a consecutive narrative. He discusses many of the leading questions in Indian administration, such as the exercise of judicial and executive functions, the police, educational problems, the causes of "Indian unrest"; he devotes a chapter to Christian missions, deals with certain of the chief incidents in the history of the period of his connection with India, such as the partition of Bengal, and has also lighter chapters on sport, the "humours of administration," and what not. The book should be read for an understanding of European administration in India.

'Half a Century in China.' By the Ven. A. E. Moule. (London: Hodder & Stoughton. 1911. Pp. xii., 343. *Map and Illustrations.* 7*s.* 6*d.*) This is an important addition to the literature on the subject of the possibilities attendant on the present great social movements in China. The author analyses the Chinese character, drawing upon intimate knowledge, and illustrating his judgments by continual reference to personal experience. He writes from the standpoint of the missionary, but the actual topic of mission work occupies only a secondary place, and the author's position connotes no sort of narrowness of view in the consideration of his subject. He appears to foresee reform as an infinitely slow process; in some departments he doubts the wisdom of its application.

AFRICA.

The Morocco-Algerian Borderlands.

'Les Confins Algéro-Marocains.' Par Augustin Bernard. Paris: Emile Larose, 11, Rue Victor-Cousin. 1911. 12 *fr.*

An extensive review of this book might be written from the point of view of its political interest, but as such would be out of place in the columns of the *Geographical Journal*, the reviewer must confine himself to indicating the not inconsiderable additions to geographical knowledge which are furnished by this study of the borderland between Morocco and Algeria. The excellent maps and the text of the work bring home to us very vividly the curiously unequal distribution of rainfall over Eastern Morocco and Western Algeria. Semi-desert conditions, with an annual rainfall of not much more than 100 millimetres, extend northwards in a broad belt to within quite a short distance of the Mediterranean coast, and this belt of sparsely watered country has evidently intervened as a factor in history to separate Morocco from Algeria.

The Moroccan frontier town of Ujda has only an annual rainfall of 300 millimetres in contrast to Tlemcen with its 600 millimetres, a day's journey to the east; and in the vicinity of Taza, in Eastern Morocco, midway between Fez and the Muluya river, there is a rainfall of 800 millimetres in yearly average. A boomerang-shaped rain-belt extends along nearly the whole length of Morocco, from Tangier on the north to the Sus country in the south-west. To a great extent this remarkable rain-belt of 800 millimetres per annum follows the higher ranges of the Atlas. But in a general way Morocco, except for a curious space in its centre, is a very rainy country as compared to Algeria. This rainfall seems to have a direct effect on population, the zones of dense or thin population almost corresponding with the areas of well-watered or of dry country. Consequently, Morocco would seem to be, in spite of its wretched government, a better populated country than Algeria, and a country with splendid possibilities in the way of agriculture, forestry, and stock rearing. The most densely populated district in Eastern Morocco is shown to be the oasis Tafilala (generally known as Tafilelt), which is on the headwaters of the Wadi Ziz, and at no very great distance from the present terminus (Colomb) of the French railway from Oran to the Moroccan Sahara.

This railway, which has been constructed by the State for strategic purposes, has a course of about 550 miles from Oran southwards and south-westwards. It crosses the high and desolate plateaus of the Algerian hinterland, and then descends to the much lower levels of the Sahara at Beni-Unif, Figig (only a few hundred feet above sea-level). Thence the line continues to Colomb-Beshar, in the middle of a number of converging streams or wadies, the most notable of which are the Zusfana and the Gir. These unite at Igli in the south at an altitude of not much more than 600 feet above sea-level, and thence a broad watercourse is seen continuing southwards, to lose itself eventually in the sands, but representing nevertheless an ancient tributary of, or, as some French geographers think, the original headwaters of the central and lower Niger. The Wed or Wadi Gir (Guir) is of historical interest. It rises on the south-eastern slopes of the mighty Atlas range, and was visited in the early part of the first century of the Christian era by a Roman military explorer. It was undoubtedly the Gir of Roman geographers, who, however, sometimes confused it with the headwaters of the totally distinct Daradus or Draa. It is interesting, however, to note that Pliny describes it in connection with the greater river lying much farther to the south, the "Nigir," which last named is the origin of our present "Niger."

By the aforementioned State railway the very interesting oasis of Figig has been made accessible to tourists. It is, in fact, as the present writer can testify by recent personal experience, only five days' journey from London. Unfortunately, the railway station (Beni-Unif) and the hotel are 6 or 7 miles from the outskirts of Figig, and no easily obtained means of transport exists other than one's own legs. The people of Figig are now very civil and friendly towards Europeans. The collection of mud-brick towns is highly picturesque. To the north, east, and, above all, to the west, is a magnificent amphitheatre of mountains culminating in distant views of the High Atlas range, with its sublime snows and its deep blue-purple flanks. From these mountains innumerable streams descend, and some of these are so directed at Figig that they permeate the amphitheatre-like oasis, maintaining in existence splendid forests of date-palms, many fruit trees, and fields of barley. Under the name of Zusfana (with other tributaries and wadies) this water disappears into the Sahara desert, which from Beni-Unif can be seen in an aspect of remarkable

grandeur. The broad wadies, especially in the winter season, retain open pools of water. The beds of these half-dried rivers are remarkable for the extraordinary transverse ribs of rock, as though the ancient river had carved its way at right angles through recumbent and diversified strata.

All this country of easternmost Morocco is admirably described by Prof. Bernard, and most aptly illustrated by photographs and maps. He deals quite as exhaustively with the Tell or coast region of Eastern Morocco, the valley of the Muluya, the interesting old town of Ujda, and even extends his studies to the Spanish settlement of Melilla. All that he has to say about the work of Spain in and around Melilla is of great political interest at the present day. So are his notes on the picturesque Berber towns in the well-watered region between the sources of the Gir and those of the Zusfana. Instances of special picturesqueness, both in natural features and in buildings, are the towns of the valley of the Wadi Ait Aissa and the Ksar of Bu-Denib. It is evident that in this direction the French are opening up a region of fascinating interest to the tourist and the seekers of sunshine in winter. The author of this book makes many interesting remarks on the forests of the High Atlas and the possibility of reforesting much of this region, where, especially during the last hundred years, the natives have destroyed the forests recklessly. He also shows with emphasis how essentially Berber is the population of Eastern and Western Morocco and Western Algeria. He recommends the renewed study of the Berber dialects by French soldiers and officials, as in many parts of South-Eastern Morocco Arabic is scarcely known or spoken. It is difficult within the confines of a short review to do justice to this book, which should be carefully read, not only by geographers interested in North Africa, but by politicians who wish to gauge the present difficulties of the French and Spanish position in Morocco and form some adequate idea of the splendid work which has been achieved in these regions by French soldiers and civilians, sometimes, as the author points out, by the simple soldier, with his passion for growing salads (which progresses rapidly into the creation of beautiful gardens), and his knack of raising neat and comely buildings, and of getting into friendly, almost brotherly, relations with the Berbers, many of whom are as European-looking as himself.

H. H. JOHNSTON.

ANTHROPOLOGY OF NUBIA.

'Ministry of Finance, Egypt. Survey Department. The Archæological Survey of Nubia.' Bulletin, Nos. 1–4. Cairo, 1908-9.

An important contribution to the anthropology of Nubia has been made by the Archæological Survey, carried on under Government auspices, with a view to investigating the ancient burial-places along the banks of the Nile between Aswan and Korosko which will be submerged when the new Nile barrage is completed. The work has been carried on under the direction of Dr. G. A. Reisner, and the first four *Bulletins* of the Archæological Survey of Nubia contain the results of the first two seasons' work, 1907–8 and 1908–9. Excavations were made at eighty-nine cemeteries at various points along the river from Shellal to Koshtamna. The burials are classified in periods corresponding with the recognized periods in Egypt: Predynastic, Early Dynastic, Old Kingdom, Middle Kingdom, New Empire, Ptolemaic-Roman, Byzantine-Pagan, Christian, and Moslem. The conclusions arrived at by Dr. Reisner and his colleagues, Dr. G. Elliot Smith, F.R.S., and Dr. F. Wood Jones, are that during the pre-dynastic and early dynastic periods lower Nubia was inhabited, not by Negroes, but by Egyptians;

that about the time of the third Egyptian dynasty an important transformation of the population began, due to an admixture with Negro blood. These "Archaic-Nubians," as Dr. Elliot Smith calls them, showed a marked change in physical characteristics and in culture, which now first became differentiated from the culture of Egypt. Whilst in later periods the culture again showed Egyptian predominance, the admixture with the Negroes became more and more pronounced. The outstanding feature of the "survey" seems to be the light thrown upon the origin of the Barabra or Nubians of the present day. These are evidently the descendants of the admixture of the ancient Egyptians and Negroes.

"The process of racial blending," Dr. Elliot Smith writes (Bulletin No. 3, p. 27), "took place on the frontier of Egypt by the grafting of a more or less continuous series of Negro elements on to the original Egyptian population of Lower Nubia."

"One curious result of the Negro admixture in Nubia," Dr. Elliot Smith tells us (Bulletin No. 4, p. 19), "has been that the average length of the cranium has undergone a progressive shortening—the skull of the archaic Nubians (Reisner's B group or Late Ancient Empire) is shorter than that of the early dynastic and predynastic population of Nubia; that of the Middle Nubians (C group or Middle Empire) is shorter still, and this process of abbreviation is carried a stage further in the Byzantine Nubians (*i.e.* Nubians of 200 to 600 A.D.) and the modern Barabra. When it is recalled that the Negroes who entered Nubia in the times of the Ancient Empire were people of small stature, and that the smaller Negroes inhabiting the upper Nile possess short, relatively broad crania, the evolution of the distinctive cranial characters of the Nubians becomes less surprising and less enigmatic than it seemed at first sight, when we had in mind only the extremely dolicocephalic Negroes found in the cemeteries of more recent dates in Nubia."

There is much suggestive matter in these reports; and it is a pity, for purposes of study and reference, that the pagination of the *Bulletin* is not consecutive, and that one cannot get a complete account of the "survey" without reference to quite a separate publication—the Annual Report. Without this or some other indication it is impossible to locate many of the cemeteries excavated, which are denominated only by numbers.

F. A. Edwards.

British East Africa.

'In Africa: Hunting Adventures in the Big Game Country.' By John T. McCutcheon. *Photographs and Cartoons.* Indianapolis. The Bobbs-Merrill Co. 1910.

'Grand Gibier et Terres Inconnues: Afrique Centrale.' By Maxime de Bary. 2nd edition. Paris: Librairie Plon. 1910. 10 *fr.*

Each of these volumes has qualities which give freshness and individuality to the now often-told tale of big-game hunting in British East Africa. Mr. McCutcheon writes just as a man would talk of his adventures, and when the narrator can spin a good yarn (as in this instance) the result is excellent. Cartoonist to one of the leading American newspapers, Mr. McCutcheon has further lightened his letterpress with numerous humorous sketches. The Akeley expedition, of which he was a member, visited the Tana river and Kenya districts, and also the Guas Ngishu plateau and Mount Elgon. For a time he and his companions joined forces with Mr. Roosevelt's safari. Hunting adventures apart, the most interesting chapters in the book relate to Mount Elgon and its wonderful caves. The description of the ascent of the mountain is very

vivid, and is accompanied by a number of fine photographs. Incidentally the author has shrewd observations about the natives and the white settlers, and in a concluding chapter he deals with questions of outfit, climate, etc.

M. de Bary's account is welcome partly because it is that of a Frenchman; we get, that is, a new view of a subject already extensively treated by British and American writers. Again, M. de Bary purposely omits many of the technical details which often make hunters' books wearisome, confining himself to recording his own experiences and observations and those of his companion, M. Jean Lefebvre. The value of the book depends, therefore, on the author's powers of observation and narration, and M. de Bary proves his possession of a satisfactory measure of both gifts. As in Mr. McCutcheon's book, the most interesting part of his story deals with the Mount Elgon district. The travellers were here in imperfectly known country, and the record of their journey has original value. One of the difficulties of African travel is illustrated by the statement that to communicate with their Wandorobo guide they had to employ seven men and eight languages; another, in the attempt of a hostile tribe to get rid of the safari by bringing presents of poisoned milk. The whole story is vivaciously told. There are many illustrations, and a good map is given. F. R. C.

AMERICA.

Brazil.

'Brazil.' By Pierre Denis. London: Fisher Unwin. 1911. Pp. 388. *Maps and Illustrations.* 10s. 6d.

South American commercial interests are among the most important in this country to-day, and although the Argentine probably ranks first among the Latin republics in respect of public estimation as a field for investment, while its chief exports are of a higher annual value than those of Brazil, the larger territory possesses a wider range of sources of wealth, in coffee, rubber, and various minerals. A remarkable tribute to these is found in the enormous commercial development which is taking place in spite of the fact that the finances of the country have only lately been put on a satisfactory footing, and that the habit of revolution is not quite forgotten by some Brazilians. It is well, therefore, that the South American series is now extended to cover Brazil, and that a work on the land, its resources and its history, as comprehensive as possible for so vast a territory, is brought within reach of English readers. Moreover, Mr. Miall's translation preserves much of the attraction of the original, written in the best of descriptive languages, and the translator has added a chapter on history, while Mr. Vindin supplies a statistical review of industries and commerce. The general physiography of the country is well brought out by the original writer, though not on any very regular plan, and as an appendage rather than an introduction to his study of natural products and economic conditions. However, the volume is adequately mapped and illustrated, and on the side of economic geography there is much to be learned. Certain well-known features of economic development in North America, such as the process of settlement following, not forerunning, the construction of railways, are reproduced here in the south, and while demonstrating this, M. Denis draws the contrast between the long period when settlers were contented to know only the eastern seaboard of the United States, and the immediate necessity found by Brazilian colonists of surmounting the wall between the littoral and the interior plateau. O. J. R. H.

'What America is doing.' By Annette M. B. Meakin. (Edinburgh: Blackwood. 1911. Pp. xvii., 364. 10*s.* 6*d.*) The sub-title of this volume is "Letters from the New World," but the letters, apart from the usual superscription and subscription, rather resemble essays on current social and administrative topics in the United States, subject to references to the writer's travels and descriptions of things seen. The present prosperity and the political and economic future of the country are apparently accepted on the estimate of its own most enthusiastic citizens; the writer's view of the future of her own country is, by contrast, often most pessimistic, though it may be doubted whether the reader is not intended at times to infer an undercurrent of sarcasm.

'Au Brésil. Du Rio São Francisco à l'Amazone.' By P. Walle. (Paris: Guilmoto. 1910. Pp. 464. *Maps and Illustrations.* 10 *fr.*) Two previous works on Brazil, as well as one on Peru, form the basis for this writer's claim to authority on South American topics. His journey from the Uruguay to the São Francisco (a mission entrusted to him by the French Minister of Commerce and the Société de Géographie Commerciale) enabled him to present a study of resources and economic conditions in the southern and central states of Brazil. The present volume takes up the tale as regards the northern littoral states, and also touches upon the possibilities of the little-known interior of the Amazon basin. The book is divided according to states, and is copiously illustrated, though rather indifferently mapped.

THE MONTHLY RECORD.

THE SOCIETY.

FIELD MARSHAL His Royal Highness the Duke of Connaught has been pleased to become Honorary President of the Society. The last Honorary President was the present King when he was Duke of Cornwall and York. On the death of Queen Victoria and the accession of King Edward, the Duke of Cornwall, as Prince of Wales, became Vice-Patron. The Fellows will be gratified to learn that the President, the Right Hon. Lord Curzon of Kedleston, has been created an earl, and will henceforth be known as Earl Curzon of Kedleston.

EUROPE.

Seiches in Windermere.—Writing to *Nature* of April 27 of this year, Mr. Gordon Dobson gave a brief summary of the results of recent observations of the seiches of Windermere, carried out by means of a recording apparatus. The lake, as is well known, is divided into an upper and a lower half by islands and shoal water near the middle, and on this account the two portions oscillate independently to a large extent. Observations below the centre revealed the occurrence of oscillations of 20·4 and 11·9 minutes, due to the uninodal and binodal seiches of the lower half respectively, and also of 3·3 minutes, probably due to a transverse seiche. The maximum range recorded was about an inch. The observations at the head of the lake gave better-marked results, owing to the much greater depth of the upper half. The periods here were well marked and had the following times: 69·7 minutes, due to the uninodal seiche of the whole lake; 14·1 and 6·6 minutes, due to the uninodal and binodal seiches,

respectively, of the upper half; and 3·4 minutes, probably due to a trinodal seiche and also to a transverse seiche of the same period. The maximum range recorded here was 1¼ inches. Mr. Dobson describes and illustrates a simple but satisfactory recording limnograph designed for the purpose of the observations.

Towns and Villages of Russia.—In an instructive study issued as a memoir of the Russian Geographical Society, M. Semenof treats of the towns and villages of Russia in connection with the physical geography of the country and the history of settlement.* He distinguishes three fundamental types in the settlement of the country: (1) The northern region, where the population is chiefly confined to the valleys; (2) the central and north-western, where the watersheds are occupied, and which falls into two subdivisions, namely, (*a*) the land along the terminal moraines of the great Russo-Scandinavian ice-sheet, and (*b*) the hillocky country bounded on the south by the black-soil region; (3) the southern region, with two subdivisions where cultivation is carried on—(*a*) in the side glens, (*b*) in the main valleys. It is interesting to notice that these divisions correspond to certain predominating crops: (1) barley; (2) (*a*) flax grown for fibre, (*b*) oats; (3) (*a*) rye, (*b*) wheat. In the north the watersheds are too moist for cultivation and are covered with peat, and the climate is severe; so that lumbering, fishing, and hunting are the chief occupations, and the population is most dense along the valleys, while in the south the watersheds are too dry. Gardening in the Crimea and Black sea littoral, main roads, railways, health resorts, etc., have effected modifications in the distribution of population. The causes which have encouraged non-rural occupations and the concentration of people in towns are fully discussed. Thus a belt extends between the morainic and black soil regions from Kief to the Volga beyond Moscow and Murom which from ancient times has offered a constant resistance to inroads of nomads from the south-east, where the land is for the most part less favourable to agriculture than on the north and south, and manufacturing industry has been developed about Moscow, Yaroslavl, Shuya, etc. In Polesie the marshiness of the soil favours urban occupations, while in the morainic lands suitable for flax urban life is confined to important historic centres, such as Vilna and Pskof and the banks of large rivers. Mining accounts for a concentration of population in the Urals and the Donets basin, foreign commerce on the coasts of the Baltic and Black seas. The towns are divided into groups according to population, and much information is given of the number of inhabitants, growth, trade, etc. The work is illustrated by a population map and many sketch-maps.

ASIA.

Former Relations of Tibet with India and China.—A remarkable contribution to the January number of the *Asiatic Quarterly*, by Dr. L. A. Waddell, C.B., has seriously disturbed our previous conceptions of the historical relations between India and Tibet, by calling attention to the fact (which has certainly been missed by historians of India generally) that about the middle of the seventh century A.D. Tibet not only conquered India, but carried off the Indian king (? Arjuna) a captive to China. Thus for a time Tibet actually became suzerain of India. Tibet was then one of the greatest military powers in Asia, and "far excelled the English in social organization and virility." The king of Tibet at the time was the famous warrior Srong tsan, who had already annexed

* "Gorot i Derevna v' Evropeiskoi Rossii." Veniamina Semenova-Tian-Shanskavo. *Zapiski*, Imp. R.G. Soc., Statistical Section, vol. **10**, No. 2. St. Petersburg: 1910.

Chinese provinces and compelled the Chinese emperor to favour him with the hand of an imperial princess. It was his close alliance with China that led him to place a Tibetan army at the disposal of China to avenge an insult which had been offered to the Chinese envoy at the Indian court. The movements of the army were directed by Tibetan generals, but the quarrel was between China and India, and the political control of the force was in the hands of the Chinese envoy, who returned to execute his mission of vengeance. The mission was very completely carried through, and, although it is not quite clear how much of India was comprised in the kingdom ruled over by Arjuna (the successor of the great Harsha), it is clear that all the districts known as Tirhut, with the ancient kingdom of Magadha across the Ganges and a great part of King Harsha's empire, were occupied by the Tibetan forces. It is recorded that 580 walled towns submitted. The route taken by the invading force is carefully worked out by Dr. Waddell, whose scholarly article gives authority for all his statements and leaves nothing wanting in support of this remarkable record. The most remarkable thing about it, perhaps, is that so important an episode in the history of India should have remained so long unrecognized. It is due altogether to the labours of European students of Chinese history that we are now made acquainted with it. It is not so surprising, however, if we recollect that the history of ancient India has only been reconstructed during the last half-century by the diligence of oriental scholars in scientific research. Amidst an enormous accumulation of ancient Indian literature, there is nothing in the shape of lucid history. Another scholarly contribution to the literature of Tibet is to be found in W. W. Rockhill's useful article (reprinted from the *T'oung-Pao*, Series III. vol. 1) on the "Dalai Lamas of Lhasa and their Relations with the Manchu Emperors of China." From 1644 to 1908 a careful review of the political relations existing between the two countries is gathered from the records of an interminable series of international expeditions and missions. Tibet had long lost its pre-eminence in Central Asia as a military power before Mr. Rockhill's story opens, where the gradual process of the affiliation to China of the Tibetan highlands is unfolded step by step. It is a story dealing with no startling episodes. Although from the historical point of view the invasions of Tibet from Mongolia and China were undertakings of far greater significance than the peaceful passing to and fro of emissaries and envoys, these military events are only incidentally dealt with; but we have delightful glimpses into personal characteristics and the curious interchange of political amenities that distinguished Dalai Lamas and Chinese emperors, and these shed quite a new light on the personality of these oriental potentates, and bring much of the hitherto vague and nebulous story of the remoter regions of the uptilted East into the light of ordinary human action and sympathy.

The "Mogaung Kyaung," Mandalay.—With reference to the statements respecting the above monastery at Mandalay (Burma), made in the *Journal*, vol. 30, p. 432; vol. 31, p. 228, information has been received to the effect that the famous monastery, which was ordered by the Government of Burma to be conserved, has been completely destroyed by fire. The Government archæologist for Burma, Mr. Taw Sein Ko, writes on the subject as follows, under date April 17, 1911: "The Mogaung Kyaung, whose conservation was sanctioned at the instance of Mr. J. C. Clancey, was burnt down last year. Similar monasteries cannot be built nowadays, with all the resources at the command of our much-vaunted civilization."

Dr. Molengraaf's Geological Researches in Timor.—The well-known Dutch geologist, Dr. Molengraaf, has lately undertaken an investigation of the

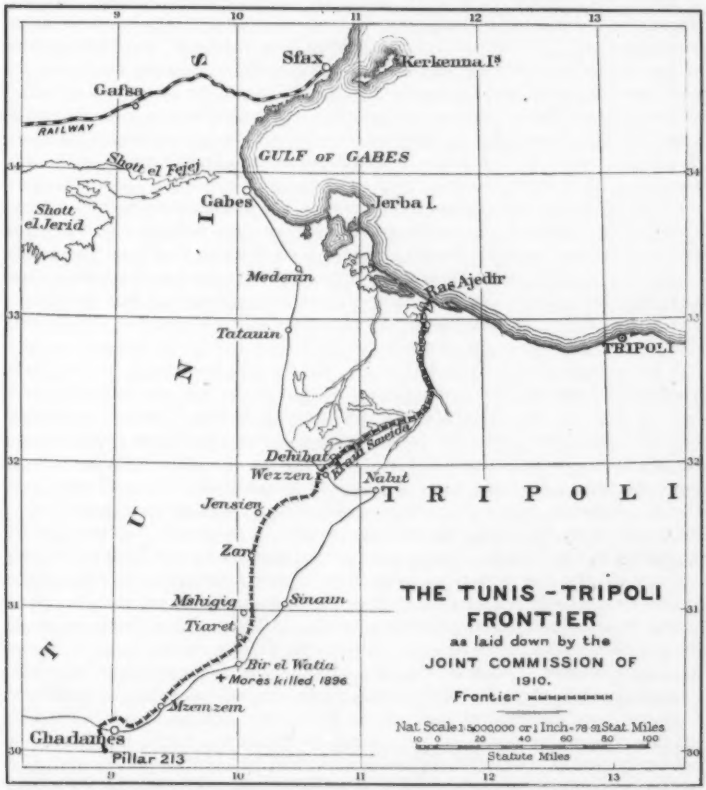
interior of Timor, and some of the first results are noted in the latest number of the *Tijdschrift* of the Netherlands Geographical Society (May, 1911, p. 470). The traveller reached Kupang on December 16, 1910, and after a short stay there went inland—a four days' journey on horseback—to Kapan, a Government post at an altitude of some 3000 feet. Hence he began to explore the eastern part of Dutch Timor, crossing to the south-east coast by a route which led at right angles to the general direction of the ranges. This part of the island had previously been crossed by another route by mining-engineer Oyens, who had made preliminary investigations to further Dr. Molengraaf's labours; and a journey from Kapan to the north-west coast was also carried out. The preliminary result is to show that, geologically, Timor is occupied mainly by three groups of formations, separated from each other by marked unconformities, viz. (1) A much folded complex of schists and sedimentary deposits belonging to the Permian, Trias, Jurassic (?), and Eocene, with intrusions and outpourings of igneous rocks; (2) a formation of Miocene or still later Tertiary age, consisting of a fossiliferous lower series of clay-slate and an upper of sandstone, etc.; (3) recent, nearly horizontal, beds of coral limestone and marl, forming in the centre of the island a landscape of the tableland type. Dr. Molengraaf has also made a geological examination of the island of Letti.

AFRICA.

Lieut. Boyd Alexander's Grave.—We have received the following note from Miss Olive MacLeod, who has lately returned from her visit to the Central Sudan: "The late Lieut. Boyd Alexander is buried beside his younger brother Claud in the tiny graveyard at Maifoni. A stone monument stands above the elder brother and a cross above the younger, the inscription on which tells who lie beneath and how they died. A few yards above, on the summit of a slope from which the country is visible for a great way, stands the fort, where the sentry on his rounds guards the graves. The parade-ground is just outside, and drill takes place here every day, and over all the bugle sounds its hourly summons. It is fitting that the soldier brothers should be in death, as in life, among martial surroundings. When Claud died, in 1904, Boyd Alexander chose this spot as the one where his brother would most wish to lie. It was enclosed in low mud walls, and spear-heads were put all round them; but it is changed now. The spears are gone, and the wall has been enlarged, so that it may be a burying-ground for all white men who die in that region. Overweg, the great explorer, is there; and Burdett, who has also contributed to the annals of travel. The Alexanders lie side by side beneath a tall white flowered acacia, which spreads its sheltering arms over both. Seed-pods drop down from its boughs on to the hard dry earth beneath, unable to fructify in that aridity; but on the graves fresh soil has been put, and seeds are planted, so that, even in death, the brothers may be in the midst of what they loved so well—a little colour, a little sweetness, and the picture of home which the sight of flowers brings to those who give their lives to work in distant climes."

The Tunis-Tripoli Frontier.—As was announced in the *Journal*, an agreement in regard to this frontier was arrived at last summer. The line adopted was afterwards demarcated on the ground by parties representing France and Turkey respectively, the French section being headed by Commandant Donau, while the topographical operations were in charge of Captain Boué. In *L'Illustration* for June 10, 1911, M. Pervinquière, who was engaged at the time on a scientific mission in the interior, gives a brief account of the

operations, illustrated by a sketch-map, which we here reproduce.* The frontier, as will be seen, runs from Ras Ajedir on the Mediterranean to a point 8 miles beyond Ghadames, and has been marked throughout by pillars. Tunis secures a good caravan route to the south, with only two belts of dunes to be crossed. The French commission erected at Mshigig a monument to the



ill-fated Marquis de Morès, who was murdered near Bir el Watia in 1896. From a servant of de Morès M. Pervinquière was able to obtain details of the melancholy occurrence.

M. Villatte's Journeys in the Sahara.—This French explorer is known for the excellent survey work done by him in the Central Sahara, for the map of which he has done much to supply an accurate basis by his careful astronomical determinations of position. The results of his first important journey, carried out in 1904, were briefly described in the *Journal* for January, 1906 (p. 87),

* According to the April number of *La Géographie*, the geodetic station in Ghadames lies in lat. 30° 7′ 48·7″ N., long. 7° 9′ 59·9″ west of Paris; Duveyrier's position, though correct in latitude, having been some 16¾ miles too far west. The above sketch does not therefore give the corrected positions as fixed by the commission.

while reference was made last year (vol. 35, p. 197) to a later journey (in 1909) by which equally valuable results were secured. M. Villatte has since presented an account of the journey, accompanied by a map, to the Paris Geographical Society, in whose *Bulletin* (*La Géographie*, March, 1911) they have lately been published. His route led south-east from Insalah (the position of which was fixed astronomically during his detention there in 1909), skirting the southern edge of the Muidir plateau, and crossing that of Ahaggar near its centre at a maximum altitude of nearly 8000 feet, the rough and rocky nature of the ground here proving very trying to the camels. It then struck south-west towards Adrar, and eventually reached the Niger (in part by new routes) at Gao; these latter portions having been accomplished in company with a party under the well-known Saharan traveller, Colonel Laperrine. The state of plenty existing on the banks of the Niger made a great impression on the men from the poverty-stricken north who formed the escort. The return to the Ahaggar region was effected from Ansongo, lower down the Niger, by a route through the lands of the Aulimiden Tuareg to the south and east of that followed on the outward journey, crossing a tract which had been previously blank on our maps. M. Villatte's narrative supplies many details on the nature and physical features of the country traversed, the state of the pasturages and water-supply, as well as on the character and condition of the Tuareg met with. In places the country was suffering from a prolonged drought, but for a large part of the way, especially on the borders of the uplands, excellent pasturages and perennial supplies of water are constantly referred to. In spite of the pacification of the country by the French authorities, the inhabitants were found to retain a dread of the plundering Azjer Tuareg, though their power for evil is now reduced to a minimum. On the return journey a week's stay was made at an encampment of the Hoggar Tuareg, and the acquaintance gained with these people showed that the notion till lately prevalent that they are bloodthirsty savages was totally incorrect, their opposition to the French advance having been inspired by a deep love of their country and the fear of its being taken from them by strangers. In the vicinity of this encampment fresh tracks of giraffe were seen, showing that in the rainy season these animals wander as far as 18° N. After reaching Tamanrasset on the southern border of the Ahaggar plateau, M. Villatte made a circular trip on its eastern borders. In all he was able to determine the positions of forty-nine important points along the route, obtaining the latitude and time correction as a rule by equal altitudes of stars (six to twelve for each position) observed by the new "prismatic astrolabe," an instrument which was found, however, to be not easily used in a wind. Longitudes were fixed by the transport of time, that of the initial meridian being obtained by occultations of stars by the moon. Magnetic observations and determinations of altitude were also made.

Conclusion of the Périquet Expedition.—Captain Périquet has returned to France after completing his surveys in French Equatorial Africa along the line of a possible railway from the coast to the interior (*Journal*, vol. 37, p. 317). He professes himself convinced of the value and feasibility of such a line, which would tap a rich region of virgin forest abounding in rubber-yielding plants. Besides fixing fifty-four new positions, Captain Périquet and his coadjutors carried out route-surveys totalling some 3000 miles, paying much attention also to the determination of levels. The traveller was much impressed by the intelligence and general character of the western Pahuins (Fans), who are said to be the most interesting people of the territory, fully equalling the Senegalese in their adaptability to civilization.

AMERICA.

Explorations in the Argentine Andes.—We have already referred (*Journal*, vol. 86, p. 496) to the systematic investigations of Andean glaciers carried out within the past few years by Dr. Fritz Reichert and various associates, the special area dealt with being that around the great massif of Mount Juncal south of Aconcagua. We also mentioned that a new expedition for the further examination of those little-known glaciers had been undertaken by Dr. Reichert at the end of 1909. Of this new expedition and its results a preliminary account appears in the *Zeitschrift für Gletscherkunde* for April of this year. It shows that Dr. Reichert's previous statements regarding the importance of this glaciated region are fully borne out, the result of the new work being to show that the glaciers of the Juncal group constitute probably the most extensive field of snow and ice in the whole of the Andes, with the possible exception of Southern Patagonia. Dr. Reichert's associates were Drs. Helbling and Bade, the former of whom carried out an accurate survey of the glacial valleys examined and the bounding ranges. The largest glacier of the whole region is that previously named First Juncal glacier by Dr. Reichert, but which he now prefers to name the Rio Plomo glacier, as it forms the main feeder of the river of that name (a tributary of the Rio Tupungato), while only some of its side branches descend from the Juncal peak. A careful examination of the whole system of this glacier was made, photographs being taken, one of which, giving an excellent general view of the glacier and the bounding ranges, accompanies the paper. It was found that many large branches descend from the Chorillos range on the northern side of the valley, as well as from the main water-parting range on the west and south. The total length of the main glacier is thought to be at least 20 kilometres (over 12 miles), and it terminates at a lower level (10,660 feet) than any other of the eastern glaciers in this part of the range. On January 20, 1910, the explorers accomplished the ascent of the next peak to the south of the Juncal, named by Dr. Reichert Nevado de Plomo (20,700 feet). They obtained a view of the western side of the range, which disclosed an unexpectedly large glacier-system on the south-west side of the Juncal, hardly less important than that of the Rio Plomo. As there is also a large glacier flowing north-west from the Juncal massif, this is now known to give rise to three independent ice-streams of the first magnitude. The latest information is to the effect that a first ascent of the Juncal itself (21,300 feet) was successfully accomplished by Drs. Reichert and Helbling on January 17 of this year.

AUSTRALASIA AND PACIFIC ISLANDS.

Dutch Explorations in New Guinea.—News of various expeditions still at work in Dutch New Guinea is given in the latest number of the *Tijdschrift* of the Netherlands Geographical Society (1911, No. 3). The most interesting is perhaps that under Captain Schaeffer, which is attempting to penetrate to the heart of the central range by way of the Island river, which enters the sea a little distance south-east of East bay, Dr. Lorentz's starting-point on his expedition to Mount Wilhelmina; an eventual crossing of the island to the north coast being also contemplated. In February Captain Schaeffer (who is assisted by Lieut. Van der Ven and Dr. de Koch) had established a camp on a summit 10,800 feet above the sea, which, being bare of trees and not overtopped by any neighbouring mountain, gave a clear view in all directions, whenever the prevailing mist cleared away. It therefore gave good opportunities for the mapping of the country, though the exposed nature of the situation (open to the full force of the west wind blowing from the Arafura sea), combined with the low

temperature, sometimes as low as 40° Fahr., made the conditions unpleasant for a long stay. On one occasion the whole upper parts of the mountains were covered with a continuous mantle of snow. All around was nothing but the most savage limestone mountains, their bare sides falling perpendicularly 2000 feet and more. In the distance a range with an average crest-altitude of some 13,000 feet was distinguishable. Native villages—one containing some sixty houses—were met with, and friendly relations established with some of the people. Exploration is also being continued in the more westerly part of the island, where much work remains to be done even close to the coast. Two parties, under the orders of Captain K. F. Koch, have been at work here, the one in the peninsula south of MacCluer gulf and west of Arguni bay, the other along the mountainous coastland between Arguni and Etna bays. Several lakes were discovered by the latter, one of which is said to be drained by a subterranean channel. The description of the country recalls that explored by recent expeditions in the British portion of the island (June number, p. 665), and, together with the facts brought to light by Captain Schaeffer (see above), seems to indicate that limestone formations play an important *rôle* in western, as in central New Guinea. One part of the country is described as a waterless stony waste, while the coast between Arguni and Etna bays is said to present the most striking resemblance to that of Dalmatia.

The British Expedition to Western New Guinea.—The news received towards the end of April that this expedition was on its way home, after accomplishing all that was humanly possible in its attempt to push inland towards the snows of Mount Carstensz by the route adopted and with the means available, has been followed by the arrival of the members of the party, which included, as will be remembered, Captain Rawling, Dr. A. F. Wollaston, and Dr. Eric Marshall. Captain Rawling, who took over the leadership after the retirement of Mr. Goodfellow, will give an account of the expedition at the meeting of the Society on July 3.

POLAR REGIONS.

American Expedition to Crocker Land.—An important expedition is being organized in the United States for the thorough scientific exploration of Crocker Land, sighted by Peary in 1906 to the north-west of Grant Land, and constituting the most northern land yet known to exist on the globe. It will be under the joint leadership of Prof. D. B. Macmillan and Mr. George Borup (both members of Peary's expedition to the North Pole in 1909), who will undertake the venture on behalf of the American Museum of Natural History, with the support of several other scientific bodies and private individuals. Both Peary and Captain R. Bartlett are taking a keen interest in the undertaking, the former giving the projectors the benefit of his experience and advice, the latter assisting personally in the preparations by taking upon him the necessary arrangements for men, dogs, and food during a trip to Etah during the present summer. The explorers will be unusually well qualified for scientific work in the far north. Among other attainments, Prof. Macmillan is well versed in tidal observations, while Borup has for some time been preparing himself for the task, both by special study and practical work at Yale University (where he graduated in 1907), and field training under the Geological and Coast and Geodetic Surveys. He will also prepare himself for zoological and botanical work at the American Museum, and is besides an accomplished photographer. It is hoped that Peary's ship, the *Roosevelt*, may be acquired for the expedition, which is reckoned to cost $25,000 for equipment and supplies. A start will probably be made in June, 1912, and, after calling at Etah to take

in dogs and supplies, the ship will, if possible, make its way north the same season to Cape Columbia, which is once more being chosen, as in the case of Peary's expedition, as the advanced base, whence the further journey will be made with sledges. It is expected that the expedition will be away at least three years. There is undoubtedly much important work to be done in the chosen locality, and valuable results may be anticipated.

The Antarctic Expeditions.—A communication from Captain Amundsen appeared in the *Times* for June 7. The only new item of special interest is the statement that, as the explorer had thought probable from the accounts of his predecessors, the ice-barrier at the point chosen for his base is not floating, but that it rests upon land whose summits could be distinguished in the background. Captain Amundsen hoped to lay a depôt as far south as 83° before winter finally set in, but it seems probable from his statements that he did not contemplate the final dash to the pole until after the return of spring. The announcement is made from Kristiania that Mr. Pedro Christofferson, a Norwegian resident in Buenos Aires, has generously offered to bear all the expenses of the *Fram* for provisions and other outfit during the ship's work in the Antarctic and until the final arrival in San Francisco. Dr. Mawson, the leader of the projected Australian expedition, has acquired a suitable vessel—the *Aurora*, built at Dundee in 1876—and the necessary preparations are being actively prosecuted under the superintendence of Captain Davis. The equipment will include an aeroplane. News was received in May of the return of the Japanese expedition under Lieut. Shirase without accomplishing anything.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Colouring of Relief Maps.—Among the Austrian workers in the direction of an improved scheme for the colouring of relief-maps, based on the optic properties of colours, Herr G. Freytag, of the Cartographical Institute of Freytag and Berndt at Vienna, deserves credit for the results attained. Like Dr. Peucker (*Journal*, vol. 37, p. 428), he has been working at the question for some years, and has arrived independently at a solution, which is briefly described in a pamphlet issued by his firm this year. It is accompanied by a specimen relief-map coloured according to the scheme adopted, the effect of which is perhaps as satisfactory as any of the attempts hitherto made in the same direction. The stereoscopic effect of the colours selected is well brought out by a pair of diagrams, in the first of which a square is coloured with the reds in the centre, these passing outwards through yellow to green and blue; in the other the order is reversed. The former gives the appearance of being raised, the latter of being depressed, in the centre. The gradations are brought about by differences in the tints, the strength remaining the same, so that violent contrasts are avoided. A list of maps, etc., issued by the firm on this system, and approved by the Austrian Ministry of Education, is appended.

Lake Ramparts.—The formation of "ramparts" on the shores of lakes by the action of ice has been frequently discussed of late years, and reference has been made in the *Journal* to more than one paper on the subject (vol. 29, p. 597; 32, p. 190; 35, p. 81). Mr. J. B. Tyrrell having stated, in a paper in the *Transactions of the Canadian Institute* for 1910, that he has never, during many winters' observations of the Canadian lakes, detected any evidence of ice-push against lake-shores as a result of expansion, Prof. W. H. Hobbs has discussed the question of the conditions requisite for the formation of ramparts by ice-action (*Journal of Geology*, February–March, 1911), the absence of such

conditions in many lakes accounting for the restricted occurrence of the ramparts. He sums up the necessary factors as follows: (1) There must be a wide, and probably also a sudden, alternation of lower and higher air-temperatures over the lake; (2) these changes must be promptly communicated to the ice; (3) the ice-cover must be competent to transmit the stresses to the shore; (4) for large effects the alternations of temperature must be several times repeated. Of these, the second and third are crucial. A snow covering, by preventing a quick communication of air-temperatures to the ice, stands in the way of the sudden contraction and expansion of the latter by which the formation of ramparts is explained. Further, as the required action can only take place if the ice remains level (since by buckling it will lose its horizontal energy), a snow-cover is unfavourable to the formation of ramparts owing to the bending effect exerted on the ice. Experience shows that in any case ramparts are only formed where the lake or bay is of limited extent, so that there is no great tendency towards buckling of the ice.

GENERAL.

The Teaching of Geography in London Elementary Schools.—A recently issued report on this subject is one of a very valuable series which is being issued at the instance of the Education Officer of the L.C.C., dealing with the methods of teaching various subjects in the elementary schools of London. It is the outcome of a conference between practical teachers in all grades of school and college, geographical authorities such as Dr. Scott Keltie, Profs. Herbertson and Lyde, and officials with experience of educational administration. In the nine hundred schools of the L.C.C. elementary education is given to nearly three-quarters of a million children—more than the total attendance in the elementary schools of Scotland or of the whole Australian Commonwealth. Moreover, as no attempt is made to prescribe a syllabus, a report of such general interest and so wide an outlook should be in the hands of every teacher of geography. After a serviceable account of the history of geographical education, and the methods now in existence, special chapters deal with familiar topics—general considerations on method, the relation of geography to other subjects, equipment and apparatus, maps and lantern slides. The gist, however, of the report and its distinctive feature lie in the chapters devoted to method as applied to junior divisions (7–10 years), senior divisions (10–13 years) and to higher elementary and higher grade departments. For the junior divisions there are sketched four admirable courses in the elements of anthropogeography—life in the zones, the habits and occupations of man, life in different geographical surroundings, and a general review of historical geography, to be followed by a fifth so treating the home country as to develop the understanding of the map. The more advanced courses are packed with sane and stimulating suggestion. If the narrowness of a specific syllabus was to be avoided, it was inevitable that the total given in any chapter should be beyond the powers of any single school, "but to some teacher and to some class each of the points dealt with may be of value." This is to say that the usefulness of the suggestions varies with the capacity of the teacher. In the higher grade department, where the work is to be of a more intensive character, the teacher may be expected to be master of his subject. For the senior divisions, if the help here given is to have proper value, further amendment is required in the geographical training of teachers. The last two chapters deal with examinations and this training.

Association of American Geographers.—We have received from Prof. A. P. Brigham, secretary to this Association, an account of the seventh annual

meeting, held at Pittsburg, December 29-31, 1910, under the presidency of Dr. H. C. Cowles of the University of Chicago. Dr. Cowles' address was upon the subject, "The Causes of Vegetative Cycles." Public lectures were given by Prof. Mark Jefferson on "Rocky Mountain Forms," and by Dr. Cowles on the "Origin and Destiny of the Everglades." Prof. Rollin D. Salisbury conducted a round table conference on the "Purposes of Geographic Instruction, and the phases of the subject best adapted to these purposes." About twenty-five papers were read by the members. The Association decided to establish a publication, and has appointed the following Publication Committee: Richard E. Dodge, chairman and editor; Alfred H. Brooks, Henry C. Cowles, and Ralph S. Tarr. Following the discussions of the round table conference, the Association adopted the following resolutions: (1) That in the opinion of this Association physical geography fully deserves to retain a place in the high school; (2) That the disappointment or dissatisfaction sometimes expressed regarding the results of teaching this subject is in large measure due to inefficient teaching; (3) That as a means of removing this dissatisfaction, superintendents and principals are urged to procure teachers of physical geography adequately prepared in the subject, and to entrust the subject only to such teachers; (4) That no teacher of physical geography should be appointed in any educational grade who has not made serious and special study of the subject in a higher educational grade." The next meeting will be held in Washington in connection with the American Association for the Advancement of Science.

Proposed New Science Museum.—As a result of the deliberations of a departmental committee, appointed to consider the present state and possible development of the collections at the Jermyn Street Museum and at the Science Museum at South Kensington, a far-reaching scheme has been put forward, according to which the existing collections would be entirely rearranged, and provision made for much-needed additions in certain directions in the future. It is suggested that the Jermyn Street collections, now much crowded, should, if possible, be housed in a suitable building at South Kensington, so as to form, with the collections already in the Science and Natural History Museums, a complete illustration of the whole field of geological science. It is matter for satisfaction that the scheme also takes into consideration the need of a systematic representation of geography as a whole. Fear has been expressed in some quarters that by carrying out the scheme as suggested, the space at present available for the further extension of the Natural History Museum may be unduly encroached upon. This is, no doubt, much to be deprecated, but it is to be hoped that a way may be found of carrying out the recommendations of the committee in such a way as to obviate any fear on this score.

The Eighteenth Congress of Americanists will be held next year in London, the invitation issued by the Royal Anthropological Institute, through its president Mr. A. P. Maudslay, having been accepted by the Congress. The President-elect is Sir Clements Markham, and our Society, which is making a grant towards the expenses of the meeting, is also represented on the general committee by the President, Major Darwin and Mr. Maudslay. It has for some time been felt as something of a reproach to this country, which has taken so large a part in the exploration and colonization of America, that it should not hitherto have extended hospitality to the Congress, which since its first foundation has met in most of the European countries, as well as in the United States, Canada, Mexico, and Argentina; and it is matter for satisfaction that

this is now to be removed. It is hoped to obtain a grant in aid from Government, as well as contributions towards the expenses (which cannot but be considerable) from institutions and individuals interested in subjects cognate to those discussed at the Congress. This country possesses in museums, both in London and elsewhere, most important collections illustrating the ethnography and archæology of America; and opportunities for the study of these will no doubt be afforded to the members. It is also suggested that many objects of interest now in private hands might be brought together and exhibited. Arrangements are being made for the session of the Congress, which will be in the week commencing May 28, 1912, to be held at the Imperial Institute.

The late Mr. Noel Williamson.—In our obituary notice of Mr. Williamson, lately murdered by Abors on the Assam-Tibet frontier, we omitted to mention that he was the third son of the late Colonel James Williamson (formerly Oswald), 26th Panjabis, and was brother of Major C. Williamson Oswald, R.A., who is a Fellow of this Society.

OBITUARY OF THE YEAR.

THE following is a list of the Fellows who have died during the year 1910–1911 (April 30):—

ALEXANDER AGASSIZ; Lieut. H. B. ALEXANDER; J. B. AINSWORTH; H. T. ASHBY; Captain C. W. ANDREW; ALFRED BALDWIN; C. M. BARKER; R. T. H. BODILLY; S. B. BATES; THOMAS BELL; A. C. BAILIE; General Sir E. G. BULWER; Colonel R. A. BROWN; T. R. BUCHANAN; Surgeon H. E. F. CROSS; JOHN COLES; E. H. CARDWELL; ALFRED BONHAM CARTER; D. P. CAMA; T. R. CROGER; Admiral Sir A. G. CURZON-HOWE; WILLIAM CARTWRIGHT; CHARLES DIBDIN; Sir CHARLES DILKE; G. G. DIXON; Colonel J. G. FORBES; Captain H. W. FORSYTH; J. W. GOODINGE; Rev. W. H. GROVES; J. C. GUBBINS; EDWARD GELLATLY; Rev. H. B. GEORGE; Sir FRANCIS GALTON; Sir BRAMPTON GURDON; GEORGE GREY; H. A. GRUBE; J. G. H. GLASS; WILLIAM THOMAS GREENUP; Captain P. H. HARDY; J. B. N. HENNESSEY; D. T. HANBURY; E. C. HARVIE; Sir JOHN HANHAM; Captain J. M. JAMES; Prof. W. C. KERNOT; W. J. KENNY; J. M. KERR; SIEGMUND LIPPMANN; J. W. LAING; R. K. LOVEDAY; G. N. MAULE; D. MEINERTZHAGEN; C. N. MORRISON; Sir MALCOLM McEACHARN; Captain C. M. MARRIS; J. W. B. MACLAREN; HENRY MAGILL; Colonel H. MONTAGU; JAMES MELDRUM; Sir GEORGE S. MACKENZIE; D. P. McEUEN; J. B. H. MONTGOMERY; Sir GEORGE NEWNES; F. E. PIRKIS; Lieut.-Colonel SIMPSON POWELL; Hon. C. S. ROLLS; Major E. ROKEBY ROBINSON; H. RASSAM; Rev. S. A. STEINTHAL; Colonel A. SWINTON; TRELAWNEY W. SAUNDERS; HENRY SELL; Lieut.-General F. G. SLADE; Dr. L. L. SMITH; Captain G. E. SHELLEY; W. S. STEEL; H. V. TRAPP; H. W. TRINDER; S. NUGENT TOWNSHEND; Sir EDMUND VERNEY; RICHARD GLYNN VIVIAN; JOHN E. WARD; F. S. WELLER; LORD WINTERSTOKE; Right Hon. R. SPENCE WATSON; NOEL WILLIAMSON; A. DUDLEY YORKE.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1910-1911.

Anniversary Meeting, May 22, 1911.—Major LEONARD DARWIN, President, in the Chair.

The Secretary read the Minutes of the last Anniversary Meeting, which were confirmed and signed by the President. The election of new Fellows was announced.

ELECTIONS.—*Luther Anderson, M.A., Ph.D.; Rev. I. H. Bateson; Max Guy Brisker; Donelly Graham Crofts; James G. Green; Marcel E. Hardy, D.Sc., B.Sc.; Samuel King Hutton, M.B.; Maximilian Krieger; Knud Herlof von Lindholm; Capt. ffrench MacDermot; Denis Fergus Mallory; Paul Niedieck Captain Fortescue Porter, I.A.; Major J. C. B. Statham, R.A.M.C.; Charles Wake.*

THE PRESENTATION OF MEDALS AND OTHER AWARDS.

The PRESIDENT: Our proceedings to-day commence with the presentation of the Medals and other awards, and first on the list comes the Founder's Medal, which has this year been awarded to Colonel Kozloff. Colonel Kozloff's work in Asia is well known to all who have studied geographical exploration in that part of the world. From the year 1883 onwards he was for thirteen years working with Prjevalski and his companions in those inhospitable regions, the Gobi desert, Northern Tibet, etc. Then for three years later he travelled with Roborovski, meeting many difficulties, especially in the region of Lob-nor. Lastly, he commanded two expeditions himself. In the first of these he explored that little-known region of Asia where the three great rivers of China take their rise, and in the second expedition he explored the country between Mongolia and Sechuan. On all these occasions he brought back a rich harvest of results, geographical, geological, and archæological. In fact, there can be no doubt this is a name well worthy of an award from any geographical society in the world. General Yermoloff, the Military Attaché of the Russian Embassy, has kindly consented to attend and to convey the Medal to Colonel Kozloff.

In handing this to you, General Yermoloff, I assure you it is accompanied by the very best wishes of the Society, and I hope you will have an opportunity of telling your countryman how greatly we English appreciate the magnificent work that has been done by Russian explorers in all those wide regions lying to the northward of the Himalaya.

General YERMOLOFF: The Russian Ambassador is, to his great regret, unavoidably prevented from being present here to-day, and he has deputed me to represent him on this memorable occasion, and to express to the illustrious Royal Geographical Society our grateful thanks for the high distinction which the Society has been pleased to bestow on our compatriot and brother officer, Colonel Kozloff. I desire to say that we appreciate this great distinction and honour very highly. It is indeed also a great pleasure personally to me, who have known my comrade, Colonel Kozloff, for many years, to tell you that your new Medallist is a man much and highly esteemed in the Russian army; esteemed and respected, not only as an explorer, who has in him, as your award now so brilliantly testifies, the sacred fire of Exploration, of Science, and of effort towards progress of Knowledge, but also much esteemed and respected as a soldier and a man. In the name of the Russian Ambassador, in the name of the Imperial Army, in the name of your new Medallist and of all his comrades, I have the honour to express to you our heartfelt thanks.

The PRESIDENT: Next on the list of awards comes the Patron's Medal, an award which has always been held, in the estimation of the Society, to be equal in rank to the Founder's Medal, which this year has been awarded to Dr. Charcot, the distinguished French explorer. As the reasons for this award have been fully set forth in our official documents, and moreover, as I think many of us here present must still have fresh in our minds that charming lecture in which Dr. Charcot described his journey in the *Pourquoi Pas?* with his gallant companions, to the Antarctic seas, and the dangers they there faced, little need now be said. You will remember how, in the course of his two explorations, he added greatly to our knowledge of the coast-line of the great Antarctic continent, and of the islands lying off it. But it is especially to the admirable scientific work done by that expedition to which I should like to allude to-day; for the results that he brought back in magnetic observations, in biology, in meteorology, as well as his geographical results, will ever make this expedition memorable in geographical history.

In handing you this Medal, Dr. Charcot, I assure you that it is an especially pleasant task for an English President of this Society to be handing a Medal to a distinguished French explorer. You, Dr. Charcot, bear a name honoured in science, and you have added fresh lustre to that already illustrious name.

Dr. J. B. CHARCOT: It is certainly for an explorer the highest award he can expect, to obtain the Patron's Gold Medal of the Royal Geographical Society. Sincerely, I do not think that I deserve such an award, and at all events it is not what I have done myself, but the good work which has been done by all those who accompanied my expedition, which deserves something—and they could not expect better. It is not only a great honour to have this Medal given by the Royal Geographical Society, but it is at the same time a great honour to have this Medal given by a country which counts as explorers men like Scott, like Shackleton and so many others who have done and are still doing such splendid work in the Antarctic. So, personally, I feel more strongly than I can express the gratefulness that I owe you all, for this very high distinction. There is one thing I can promise you; if we have done our best until now, in future we shall try and do better, so as really to deserve this very high reward, that I shall keep certainly as the most precious award I have ever had. It is equally for me a very great reward to see my name alongside those of Colonel Kozloff and Captain Lyons. I shall never forget, either, the very nice words that have been said by Major Darwin concerning my father and concerning my country and myself. I even hope that the very good feeling which exists between our two countries, has been for something in the decision of the Royal Geographical Society. There has sometimes, in old days, been difficulties between our two countries; but I suppose it was for the love of sport, and these difficulties have always been treated in a very sportsman-like way. There is one thing that cannot be forgotten, and pleasant to be remembered now. When Captain Cook was in the south, war was declared between France and England, and immediately the French King issued an order to all his officers that if they met Captain Cook at sea they were not to molest him, but even to give him as much help as they could, so that he might bring back to his country the rich collections he had gathered, and all the great things he had done. When countries simply think of doing that in war time, it is the best proof they have high feelings one for another. Nothing to me is more valuable than this award given by the Royal Geographical Society of London.

The PRESIDENT: Third on the list comes the Victoria Research Medal, which, as you all know, is not given every year, but only when a recipient is forthcoming,

who, by his geographical researches, has unquestionably won this distinction. This year it has been unanimously awarded to Captain Lyons by the Council. Captain Lyons was the Director-General of the Egyptian Survey, and during the time he had charge of that Department, the cadastral and the geological surveys were commenced and pushed forward to a very advanced stage under his guidance. A number of important memoranda were also issued, inspired by him. But the work for which he will be best known is his admirable book on the Physiography of the Nile and its Basin—a work which undoubtedly deserves our very highest praises.

Captain Lyons, in handing this medal to you, let me give you the very heartiest congratulations of the Society, and let me also congratulate the Society that you have kindly undertaken to act as one of its Honorary Secretaries.

Captain H. G. Lyons: I am most grateful to the Royal Geographical Society for the very great honour they have conferred upon me, in awarding me the Victoria Research Medal this year, and also to you, sir, for the very kind and appreciative words you have spoken about my work in Egypt during the twenty years that I spent there. But there was always a large amount of work to be done, and time was scant, so that opportunities for research had to be taken as they offered; however, I had the advantage of being in a country where plenty of material was available in which research could be undertaken. For a geographer the deserts are not so barren as they may seem to be to some, and the highly cultivated lands of the Nile valley propound a number of geographical questions as well as the economical and agricultural ones; in the Nile basin there are a host of problems to be dealt with, many of which are still unsolved; and among the records of the earlier travellers and explorers there was also much which had been half forgotten, and some that had been overlooked altogether, though still of great value, so that material was in no way lacking. Whether in the topographical or cadastral survey, or in meteorology, or in hydrography, everywhere there were problems of the highest interest, and it is a very proud moment for me to find that the results which I have been able to obtain in these fields are estimated at so high a value by the Royal Geographical Society, that they are recognized by the award of a Research Medal. I have to tender my very sincere thanks to the Society for the honour they have done me in adding my name to the roll of their illustrious Medallists.

The President: In passing on to the other awards, I regret to say that very few of those to whom these awards are granted are able to attend to-day, they being for the most part still at work in distant parts of the world. Dr. Arthur Neve, to whom the Back Bequest has been awarded, did admirable work both concerning the physical geography and the glaciology of the Himalayas during his residence in Kashmir, and his publications are of high merit. Dr. Neve, in handing you this, I note that you have chosen an award which marks the fact that you intend to continue your labours; and I may say that we look forward with confidence to more coming from one who has already done so much.

Dr. A. Neve: I beg to tender my thanks for this honour, which for my part I feel to be entirely undeserved, and perhaps, as in most cases, the more welcome the less it has been deserved. It was my good fortune to be with my friend Dr. Longstaff on that interesting expedition when we added 300 miles of barren ice and snow to the Empire, and probably nothing will come of it, unless an unexpected gold-mine be found there, and when I mention that that region has already been explored by such men as our noble President, Lord Curzon, who discovered the sources of the Oxus, and associated with such names as Sir Francis Younghusband, Captain Deasy, Dr. Stein, and Dr. Sven Hedin, you

will realize there is little left to be done there, and yet I think there is something, and I should be glad if that fascinating mountain region of the Karakoram might tempt some more explorers, for some of the work I feel requires elaboration. It cannot be done successfully from the Indian side. It is impossible to transfer the necessary amount of provisions across those passes; there is no food beyond, and the rivers are bridgeless. It would be necessary, therefore, for expeditions to work in collaboration—one to go over the known routes, and the other to make new passes and to join beyond. The thing should be done in honour of our country. It was my good fortune to notify the extraordinary advances of some of the glaciers in Hunza, 10 miles in three years, and probably the whole of that 10 miles in the three months of three succeeding summers. A glacier of that kind would be an awkward customer to meet on a dark night. Perhaps some Fellow of the Society may be so fortunate as to observe those extraordinary conditions under which such advances may be possible, for they are not understood. I may say this is a recognition of work done in some holiday expeditions, and last summer I revisited the Barmal glacier, about which I hope soon to give a report. I have to thank you, sir, for this award.

The PRESIDENT: Next on our list comes the Gill Memorial, which has been awarded to Captain Leachman for his journeys in North-East Arabia. I believe the districts he traversed had not been visited by any European for twenty years, this being a part of the world which fortunately, or unfortunately, is one of the few districts left where a man can only explore at great risk of losing his life at the hands of his fellow-creatures. I am sure that we shall all congratulate Captain Leachman that he returned alive to this country, and we congratulate ourselves as well, because we shall hope to get more good work from him in the future.

Next comes the Murchison Bequest, which has been granted to Dr. Grenfell. Here again we shall all remember that excellent lecture of his in which he described his work, as a result of which our knowledge of the coast of Labrador was so materially increased. The award is given for his geographical services alone, but we cannot forget the admirable philanthropic work he has done in that region.

Last on the list comes the Cuthbert Peek Grant, which has been awarded to Mr. R. L. Reid, who was for six years in the Congo district surveying the Aruwimi river, and who with his brother added greatly to our topographical knowledge of the country to the northward of that river. The work he did was exceedingly good. He well deserves the honour—even a higher honour—than that which he has obtained.

The President then delivered his Anniversary Address (see p. 1).

After the address, Sir THOMAS HOLDICH proposed a vote of thanks to Major Darwin as follows: There now involves on me a duty, which to me is a somewhat sad one, to ask you to join cordially in a vote of thanks to Major Darwin, not only for the admirable address with which he has just favoured us, but for the long services he has devoted to this Society with all his heart and soul. This is not the time, nor do I think it quite the place, to enter into a long disquisition on the nature of those services. That, I feel confident, will be better done elsewhere, and I may add that, as a very old friend of Major Darwin, I would most willingly spare him the terror of being praised to his face. This much, however, I must say, that for us who are members of the Society, it has been not only a matter of great pleasure, but of great pride, to have a man with so illustrious a name to rule over us. We have been thoroughly proud of our President, and with our pride there has always been associated a feeling of confidence. We

have always felt certain that whenever he occupied the Presidential chair, everything would be done that could be done in order to make those meetings over which he presided (and you will remember that some of them have been of almost world-wide importance) a success. I think that I never knew a man who possessed the faculty of adjusting the balance between the necessities of the occasion and the amount of speech-making that should fit into that occasion, so well as Major Darwin—not a word too much, not a word too little; but especially, *not a word too much;* and in this may I hope that all future Presidents of the Society will accept his admirable example. We may remember, and it must be a great pleasure to us to remember, that whilst we are losing our President we are not losing the man. We shall have Major Darwin still with us, we hope, for many a long year to come to assist in the Councils of the Society and to lead us more or less in the way we should go. I will just simply ask you to thank Major Darwin whole-heartedly for all that he has done for the Society.

Major DARWIN: When my old friend Sir Thomas Holdich rose, I felt greatly tempted (for I guessed what he was going to say) to adhere to the strict rules of the Society, and to rule him out of order. But in truth I thank him most sincerely, and you also, for the kind way in which you have received his remarks. I have already expressed my sentiments on quitting this office, and Sir Thomas Holdich's remarks only strengthen my feelings. I have thanked the staff, and I should like also to thank the Council, for the way in which they have made my path so smooth. It has been a deep satisfaction to me that such absolute harmony has prevailed in the Council—that will be one of the things I shall look back upon with greatest satisfaction. I cannot make a speech—I can only thank you all most sincerely.

The report of the Council was then read and is published in the current Year-book.

The ballot was then taken for the election of Council, and the President announced that the Council list was adopted.

The Council list is as follows, new members or those changing office being printed in italics:—

President: *Right Hon. Lord Curzon of Kedleston*, P.C., G.C.S.I., G.C.I.E., etc.; *Vice-Presidents:* Admiral Sir Lewis Beaumont, G.C.B., K.C.M.G.; *Major Leonard Darwin; Douglas W. Freshfield;* Colonel Sir T. H. Holdich, K.C.M.G., K.C.I.E., C.B., R.E.; Sir Clements R. Markham, K.C.B., F.R.S., F.S.A.; H. Yates Thompson. *Treasurer:* Edward L. Somers Cocks. *Trustees:* Right Hon. Lord Avebury, D.C.L., F.R.S.; Lord Belhaven and Stenton. *Hon. Secretaries:* Colonel Sir Duncan A. Johnston, K.C.M.G., C.B., R.E.; *Captain H. G. Lyons*, F.R.S. *Foreign Secretary:* *Right Hon. Sir George Taubman Goldie*, K.C.M.G., D.C.L., F.R.S. *Councillors:* Dr. Tempest Anderson; *Sir Hugh Barnes*, K.C.S.I.; *Colonel Charles F. Close*, C.M.G., R.E.; Captain H. H. P. Deasy; Professor Stanley Gardiner, F.R.S.; Sir William Edmund Garstin, G.C.M.G.; Lord Glenconner; Colonel R. C. Hellard, C.B., R.E.; *D. G. Hogarth*, M.A.; *Sir E. F. im Thurn*, K.C.M.G., C.B.; Sir Harry H. Johnston, G.C.M.G., K.C.B.; Right Hon. Lord Lamington, G.C.M.G.; *Dr. T. G. Longstaff;* Halford John Mackinder, M.A., M.P.; Alfred P. Maudslay; Colonel F. R. Maunsell, C.M.G., R.A.; *Professor J. L. Myres; Admiral H. E. Purey-Cust*, C.B.; Colonel Sir Colin C. Scott-Moncrieff, K.C.M.G., K.C.S.I., R.E.; Sir Ernest H. Shackleton, C.V.O.; Sir F. E. Younghusband, K.C.I.E.

THE ANNUAL DINNER.

The Annual Dinner of the Society was held at the Hotel Cecil on the evening of May 26, with the new President, the Right Hon. Lord Curzon of Kedleston,

in the chair. Amongst those present were the following Medallists: John Forrest (1876); Captain Henry Trotter, R.E. (1878); Sir John Kirk, M.D., K.C.M.G. (1882); A. R. Colquhoun (1884); Lieut.-Colonel T. H. Holdich, R.E. (1887); Clements R. Markham, C.B. (1888); Lieut. F. E. Younghusband (1890); F. C. Selous (1893); Hon. George N. Curzon (1895); St. George R. Littledale (1896); Dr. Sven Hedin (1898); Captain H. H. P. Deasy (1900); James McCarthy (1900); E. G. Ravenstein (1902); Sir Martin Conway (1905); J. B. Bartholomew (1905); Dr. M. A. Stein (1909); Sir Ernest Shackleton (1909); Colonel H. H. Godwin-Austen (1910); Dr. J. B. Charcot (1911); Captain H. G. Lyons (1911). Among other guests and Fellows were the following: Count Gleichen; Viscount Morley; Earl of Cromer; Lord Strathcona; Earl of Ranfurly, Viscount Haldane; Count Wrangel (Swedish Minister); the Chinese Minister; M. Vogt (Norwegian Minister); Earl of Dunraven; Earl of Moray; Earl of Camperdown; Lord Lamington; Sir Thomas Barlow (President R.C.P.); General Sir James Hills-Johnes; Sir Hubert von Herkomer; Sir William Anson; General Sir A. Nicholson; Vice-Chancellor of Oxford; Sir G. Taubman Goldie; Admiral Sir Lewis Beaumont; Admiral Lord Charles Beresford; Sir George Reid (High Comm., Australia); Sir Claud M. Macdonald; Sir Archibald Geikie President R.S.; Admiral Hon. Sir E. R. Fremantle; Earl of Scarbrough; Sir David Gill; Admiral of the Fleet, Sir F. W. Richards; Sir John Durnford; Sir Hugh Barnes; Sir Edward Poynter; General Sir R. Baden-Powell; Head Master of Eton; Lord Brassey; Sir Edward Clarke; Sir Colin Scott Moncrieff; Mr. G. E. Buckle; Sir Arthur Birch; Sir Alex. Swettenham; General Sir C. M. Clarke; Sir Oliver Lodge; Vice-Chancellor; London University; Sir Patrick Playfair; Colonel D. M. Lumsden; Dr. P. L. Sclater; Dr. H. Cordier; Dr. Loczy; Sir Everard im Thurn; Sir Donald MacAlister; Mr. H. T. Butlin (President R.C.S.); Sir Charles Bowen; Sir Thomas Fraser; Major Leonard Darwin; Mr. H. Yates Thompson; Mr. D. G. Hogarth; Colonel Sir Duncan Johnston; Archdeacon Sinclair: General Sir A. Lyttelton-Annesley; Prof. Coleman; Colonel C. F. Close; Colonel R. C. Hellard; Archdeacon Cunningham.

The PRESIDENT, in proposing the toast of "The King, our Patron," said that ever since the Society was founded, eighty years ago, the Sovereign of these realms had been their Patron. Among those Sovereigns none had established such a particular claim to the admiration and respect of the Society as his present Majesty. He was the most travelled Sovereign who had ever sat on the throne. He doubted if there was a single man in the British Empire who had seen as much of that Empire as the King. The President read the following telegram which had been sent to the King:—

"The President, Council, and Fellows of the Royal Geographical Society, assembled at their annual dinner in the Hotel Cecil with their guests from all parts of the world, desire to convey to Your Majesty, their Patron, the assurance of their devoted loyalty, and the hope that Your Majesty, the most travelled Sovereign who has ever reigned over the British or any Empire, may enjoy a long and a glorious reign.—CURZON, President."

The King sent the following reply:—

"As Patron of the Royal Geographical Society, I have received with much satisfaction the message of your loyalty, devotion, and good wishes, which you the President and Fellows have addressed to me on an occasion so auspicious in the history of the Society. I keenly look forward to renewing my travels this autumn by visiting again the Eastern peoples of my Empire."

The PRESIDENT then proposed the toast of "The Queen, Queen Alexandra, The Prince of Wales, and other Members of the Royal Family."

In proposing the toast of the Retiring President, Major Leonard Darwin, Lord CURZON spoke as follows: On no previous occasion has the Royal Geographical Society entertained so eminent a company, or have so many lions seated themselves at this festive board with purely pacific intentions. But this thought has occurred to me. I wonder what appearance would have been presented by this hall had these eminent explorers whom I see before me—who know all the hidden places of the Earth, who have scaled the highest peaks, have trodden the untracked deserts, and have endured extreme privations—been summoned here in the costume in which each of them achieved his supreme effort? I doubt very much if the doorkeeper would have admitted them to this room, and when, at a later hour, in orderly guise they sauntered forth into the streets, I think it still more doubtful whether they would have escaped the embraces of the Metropolitan police. As it is, the garb of civilization throws a mantle of common respectability over us all. Many privileges attach to the post of President of your Society, and not the least among them is the duty and the pleasure of proposing the toast of "The Retiring President." Major Leonard Darwin has conducted the affairs of this Society during the past three years with rare modesty, with high distinction, with great ability, and with acceptability to all. Great events have happened during his reign. He has seen our friend—my friend—Dr. Sven Hedin—accomplish the latest (I sometimes wonder if it is also to be the last) of those great trans-continental journeys across the frozen uplands and the icy peaks of Central Asia which have stamped his name among the greatest, and I would fain add, among the most cultured and accomplished, of the travellers of all times. He has seen the indomitable Shackleton fight his way over glaciers and crevasses, amid incredible privations, and with a noble fortitude, to that goal which was denied to him, which we hope will be attained by another, and to which, for all we know, his successor is battling at the present moment. It has also been his good fortune to see the redoubtable Peary, after nearly twenty years of effort, plant the flag of the United States upon the North Pole and annex to that country—I will not say a new continent, because it is reported to be of a somewhat unstable and precarious description—but a heritage of everlasting fame. Only a few hours ago I received a letter from Admiral Peary expressing his regret at not being here to-night. Will you permit me to read to you one sentence? "Please convey my sentiments of deepest admiration and respect to those noble men of the Royal Geographical Society who are present. As all the world knows, the honours and medals of that Society are not a mere formality, but are the unassailable mark and stamp of great achievements." These have been the external evidences of the term of office of my predecessor. He has also devoted himself with assiduity and with prudence to the affairs of this Society, and to the encouragement of the objects for which it exists. In every way he has shown himself the worthy son of an illustrious sire. I am almost tempted to wonder whether anything is left for me to do. However, the South Pole still remains, and I hope I am not indulging in too sanguine an estimate when I say that I look forward in my time to stretching out the right hand of welcome and offering a Gold Medal to a successful explorer of our own race. But if that good fortune be denied to me, I am equally prepared, and so will you be, to extend the welcome, to offer the compliment, to give the Medal, to any other man, be he Norwegian or Japanese or any other nationality, who obtains that coveted prize. Now will you permit me to say a word on another matter? I have long held the opinion that our Royal Geographical Society is

housed in a manner unfitting the numbers, the reputation, and the work of the Society. Our library is painfully cramped, and is scattered about in obscure and rather dismal chambers, our maps and our map-making, our trophies, our photographs—none of these have the surroundings which they deserve. We want ampler and more commodious quarters in which to do our own work and satisfy our needs, and in which we can worthily and properly welcome the distinguished men who come to us from all parts of the world. If I am able before long, as I hope, to place a concrete scheme before you, it is an object in which I am sure you will readily co-operate, and which I should like to carry to a successful issue during my term of office.

Major DARWIN replied as follows: At the Annual Meeting of the Society on Monday last, I expressed the sentiment of pride which I feel in the fact that this Society did on three occasions elect me to be its President. But that sentiment, although it is as strong as ever, is now swamped by the feeling of gratitude; gratitude to you, Lord Curzon, for your too kind remarks; gratitude to all those present for the way in which they have received this toast—indeed, for the way in which the Fellows of this Society have always received me; and above all, gratitude to the permanent staff of the Society, to whose untiring performance of their duties is due whatever successes the Society may have won during my term of office. There sits Dr. Keltie, with whom I have now worked for eighteen years in the interests of the Society in perfect harmony. Then again, I must mention the names of Mr. Heawood, and Mr. Reeves, our librarian and map-curator, whose admirable work is so well known to the Society. It is, however, only thoroughly known to your Presidents, and it has, therefore, at times escaped some of the praise it so well deserves. Indeed, as to every one employed at Savile Row, they have all always given me the most willing and kindly assistance. I have indeed been lucky in many respects; lucky in taking over the Presidency from my old friend Sir George Goldie, lucky in the number of distinguished travellers whom it has been my pleasant duty to welcome in your names, and lucky in having to hand over my office to so distinguished a statesman as Lord Curzon. Finally, if my gratitude does not take the form of a long speech, I hope you will believe that it is none the less genuine and sincere. My thanks, though brief, are truly heartfelt.

Sir GEORGE GOLDIE, in proposing the toast of "The Medallists, Past and Present," said: I am appalled at the magnitude of the honourable task imposed on me. In importance it exceeds that of what must be considered as the toast of the evening—our new President—for the whole is greater than any of its parts, and our list of Medallists includes, as one of its brilliant constituents, the distinguished name of Lord Curzon of Kedleston—or, to be quite accurate, his maiden name, the Hon. George Curzon.

But the real difficulty lies in the volume of the subject. Our *Libro d'oro*, our 'Golden Book' of Geographical Nobility, founded eighty years ago, contains about 160 names, some of which will live as long as our existing civilization, while all are known wherever Geography is studied and honoured. It is a cosmopolitan list, open to great geographers of all nations, colours, and creeds. We do not even admit Colonial Preference. How could I deal adequately with such a subject this evening? Nor have I the resource of many speakers, in satisfying you with amusing, if irrelevant, remarks; for the man who could introduce any element of levity or frivolity into this toast would be capable of "speaking disrespectfully of the equator," an offence which no geographical society could tolerate. My only course is to divide our Medallists into three groups.

There are the Past Medallists, whose labours are concluded, but whose life-work survives them. Of these I will only mention the first—Richard Lander, the discoverer of the course and termination of the lower Niger. There is a special interest attaching to his name. I said just now that our roll of fame was absolutely cosmopolitan. It is also absolutely democratic. In an age when social distinctions were far more marked than they are to-day, our Council—composed then, as now, of men of position—selected a domestic servant to head what they doubtless believed would be a lasting and memorable roll of honour. My second group consists of Present Medallists who are not present. That is their misfortune—and ours. They are scattered over the surface of the globe. I have not time to deal with them in detail, and our latest Medallist, Dr. Charcot, will agree that, *les absents ont toujours tort*. In my last group are the Medallists here to-night, and I propose to call your attention to each of them in a few words. [After doing so at some length, the speaker continued] I have kept till the end the two Medallists who will be called on to respond to this toast. Sir John Forrest, though you will hardly believe it, is the senior of those here to-night, and almost the senior of those still living; the reason being that his very remarkable work in Australia was achieved when he was quite a young man. I believe that he is the only Australian Medallist present. Of our junior Medallist, Dr. Jean Charcot, I need not speak at length, as our late President, Major Leonard Darwin, dealt eloquently with Dr. Charcot's long and great services to geographical science, in the Arctic and Antarctic regions, at our anniversary meeting last Monday.

Sir JOHN FORREST felt it a great honour to be asked to respond for the twenty-two Gold Medallists present, among whom was their President, Lord Curzon of Kedleston. Sir John explained that he received his Medal thirty-five years ago. This fact was evidence that for him time was passing away, and on the whole roll there was only one living who was senior to him. Sir George Goldie had regretted that more Medallists were not present, but he regretted to say that of the eleven Gold Medallists who had won the distinction for services in Australia, all but himself had gone to explore "the undiscovered country." Sir John went on to say that this Society had fulfilled a great mission during the past eighty years, in letting the light of civilization shine into the dark places of the world, and it had stimulated and assisted those who, often under great difficulties and privations, have devoted themselves to scientific exploration and research. What the Victoria Cross was to the soldier and sailor, the Gold Medal of this Society was to the scientific explorer of unknown and hidden lands, and the reward was given to those who distinguished themselves, not only of our own race, but the races of the whole world. In making its awards it made no distinction of nation or race. There was this difference, however, that while the Victoria Cross adorned the breast of its proud possessor, their Royal Medals were stowed away unseen among their other valuables. "Why that should be I cannot understand," said Sir John. He added, "I feel it a great honour to be here to-night, with the other Gold Medallists, as the guests of our distinguished President. We are all proud of being on the 'golden roll,' and among any other honours we may possess, I feel sure there is none we are prouder of or esteem more, than being a Gold Medallist of the Royal Geographical Society."

Dr. J. B. CHARCOT, in replying for the Medallists of the present year, spoke as follows: A few days before I left Paris one of our prominent political men said to me, "The medal that the Royal Geographical Society has decided to give you is not only a reward for yourself and comrades, but is equally a reward

for our country. Tell our friends across the Channel how proud and thankful we are for this high distinction." The man who talked thus was our Minister of War, Monsieur M. Berteaux, killed a few days ago whilst doing his duty, and that is why I am here to-day instead of following his funeral. He was the prompter of my last expedition, a brave, kind-hearted, and generous man, a hard worker, and a man who loved his country, and whose loss we shall deeply feel. I know that I may give way to my feelings here, as I know that all that concerns France is followed with sympathy in Great Britain.

There is only one word I should add, and that is thanks! Not only have you given me a distinction so high that I should never have dreamt of getting it, but the handing of it has been surrounded with the most delicate and kindest attentions. The same day I see my name associated with those of famous explorers like Colonel Kozloff and Captain Lyons, so famous that it is useless that I should recall their doings, and thus Russia, England, and France are once more united; the Patron's Gold Medal was handed to me by your late President, and the son of Prof. Charcot had the honour of getting his reward through the hands of the son of the world's great Darwin. At this table I am seated next to my friend Sir Ernest Shackleton, who has given to all the world a lesson of tremendous energy, and enterprising spirit justly crowned by the greatest success, and whom all of us Antarctic explorers consider as our master. I am equally enabled to wish Doctor Mawson here present good luck in his expedition, and to thank him for what he is doing for all of us future Antarctic explorers, as certainly better than any one else he will show all the benefit that may be reaped by expeditions purely scientific. When the South Pole shall be discovered, as I hope with all my heart it will be soon by my friend Captain Scott, who ought and certainly will plant the Union Jack there, thanks to Dr. Mawson, we may nevertheless expect to continue our work and find the necessary money. My comrades and myself have done their best, but now that we have had an encouragement from those who have always led the way, it is our duty, and we shall not forget it, to show all our thankfulness by doing better another time.

Lord Charles Beresford proposed the "Other Guests" in a humorous speech, which was responded to by Viscount Morley and Sir George Reid:

Lord Morley said that Lord Curzon had given a picture of the privations that explorers and travellers had to endure, the long tracts of desert country over which they had to travel, and all the hardships that confronted them. He thought that Lord Curzon and he, in their daily sphere, had also to travel a rather weary and homeless track and to undergo a very severe privation. The business of the politician was to go below the surface; at the same time he quite admitted that in these days the politician, or, at an rate, the British politician, was bound to be a geographer, and a geographer had to be a politician. Nobody knew so well as their distinguished President the connection between politics and geography. A politician soon found out that he must be acquainted with all those geographical considerations, processes, and the rest of it which his noble friend had referred to. If anybody doubted it, he asked him to consider the government of India. There was the scene where geographical knowledge was burnt in upon those who had to deal with the government of that enormous and fascinating dependency. In the Romanes lecture delivered by their President in the year 1907 they would find set out, with a mastery and a grasp and a surefootedness which were his own, what the relations between geography and the government of that great dependency really were. He was not at all sure that the relations between the political authorities in India and adventurous geographers were always friendly.

A very famous traveller and explorer, Dr. Sven Hedin, was there that evening. It so happened that that distinguished traveller wanted to go into Tibet by a route which he thought was most convenient to himself, and it was his (Lord Morley's) unhappy lot to forbid his going by that route for reasons which he then thought, and still thought, to be very good. That distinguished traveller, with boldness and ingenuity, balked and checkmated his prohibition. Then, as it happened, under the auspices of that Society they met and compared notes, they mingled their tears, they took the right hand of fellowship with one another, and he hoped and believed that from that day to this they had maintained their friendship. If either Dr. Sven Hedin or he were to go through all those proceedings again he was not at all sure they would not do exactly the same thing. He did not presume to say.

Lord CROMER, in proposing the toast of "The Society and the President," said: When this gathering was originally organized, it was intended that the pleasant task of proposing the health of the Geographical Society should be entrusted to a far more distinguished and eloquent personage than myself. Unfortunately, however, Lord Lansdowne, to the infinite regret of all his personal friends—and he has no personal enemies—has been suffering in health lately, and although I am glad to say that he is recovering, he is obliged to spare his voice, and cannot attend this evening. I must therefore ask you to make the best of a bad job, and to put up with the remarks which I am about to make as a poor substitute for those which Lord Lansdowne would have addressed to you.

The primary object which the Geographical Society had in view when it was established some eighty years ago, was discovery and exploration. We have been reminded in the course of this evening that the activity of explorers and discoverers has been so great of recent years that it might perhaps be thought that the Society had lost any reason for its existence. This, however, is by no means the case. There are large tracts of the Earth's surface which, although they have been discovered, are, as yet, very imperfectly known. There must be hundreds of thousands, perhaps millions, of people in Asia and Africa who have never seen the face of a white man, and still less that of a white woman. I speak of white women because when I was asked to address you this evening, I recalled to my mind an episode in my own life. Some few years ago, in company with Sir Reginald Wingate, who has rendered such distinguished service in the Sudan, I visited a remote station on the upper Nile which was then occupied by Belgian troops, many of whom, I was informed, were drawn from the cannibal tribes of the Congo. Some ladies accompanied our party. A deputation of these interesting savages came on board our steamer, and earnestly begged that the ladies would show themselves on deck, as they had never seen the face of a white woman. Whether this request was prompted by curiosity to observe the personal appearance of the ladies, or whether they wanted to eat them, is more than I can say. But in any case it would be rash to conclude that the result of gratifying their curiosity was to inspire them with any ideas complimentary to European female attractions; for we learn on the authority of the devoted missionaries who penetrate to the most remote portions of Africa that the natives of those parts do not regard whiteness of skin as a beauty, but that, on the contrary, when converted to Christianity, they often picture to themselves the devil as white, and show a marked preference for coal-black angels.

However this may be, the Geographical Society felt that, independently of discovery and exploration, a wide field was open to their activity. I will not at this late hour of the evening state at any length in what manner they have availed themselves of the opportunities thus afforded to them by giving instruction

in surveying, and in other directions. But I may mention one point as to which they have rendered admirable service. I allude to the introduction of scientific rules as regards the spelling of geographical names. It cannot be doubted that at one time a great deal of confusion and misunderstanding arose from the fact that no precise rules existed as regards the transliteration, more especially of Oriental names. I remember that at one time this question excited a good deal of what I may call the *odium orthographicum*. Some thirty-five years ago when I was in India, the whole of Indian society was convulsed upon the question of whether the spot hallowed by the exploits of Havelock and his gallant companions should be spelt L-u-c-k-n-o-w or L-a-k-h-n-a-u, and a highly respected clergyman of the Church of England called attention in a hushed whisper to the fact that if the Hunterian method of spelling were adopted, the appalling scandal would be produced that Dum-Dum would be spelt Dam-Dam. This result was fortunately averted by the wisdom of the Society in introducing a scientific system of spelling for less well-known names, but at the same time allowing numerous exceptions for places in respect to which the spelling was ratified by custom. It would indeed have been practically impossible to ask a man who wanted to go to Bombay to write to the P. & O. Company and ask for a ticket to a place spelt M-a-m-b-h-a-i. In these and many other directions the Society has rendered admirable service, not only to this country, but to the civilized world in general.

It is customary on occasions of this sort to couple a toast such as I now propose with the name of some distinguished individual who is eminently qualified to speak on behalf of the cause to which the speaker wishes to call the attention of the audience. Whose name, I would ask, could I more worthily associate with that of the Geographical Society than that of your newly-elected President, Lord Curzon? Throughout his very distinguished career, Lord Curzon's conduct has been marked by an energy and versatility, and, I may add, a moral courage —a quality which is much required by politicians at the present moment—which may perhaps at times have been equalled, but which has certainly never been surpassed. His eloquent speeches are always listened to with the utmost attention alike by his political friends and opponents. Only the other day I was listening with admiration to one of the most lucid and able speeches I ever heard made by Lord Curzon in defence of the reform of that Chamber of which he is one of the most conspicuous ornaments—a speech which I am sure my noble friends, Lord Morley and Lord Haldane, though perhaps they may not have agreed with all the substance, must have regarded with an admiration equal to my own.

I therefore ask you to drink to the health of the Geographical Society, coupled with the name of Lord Curzon.

The PRESIDENT replied.

Fifteenth Meeting, June 12, 1911.—The Right Hon. Lord CURZON OF KEDLESTON, G.C.S.I., G.C.I.E., etc., President, in the Chair.

ELECTIONS.—*Percy Lytton Baker; Dr. Matthias F. Blassneck; Lieut. Marcus Lewis Stewart Clements (King's Royal Rifles); Tarcisio Geraldo Jose d'Almeida; Arthur John Hayes; Lieut. Belgrave Edward Sutton Ninnis (Royal Fusiliers); Edwin J. Orford; Harry G. Pearce; J. Aubrey Rees; John Sampson.*

THE NEW PRESIDENT.

The PRESIDENT said: As this is the first occasion upon which I have had the honour of presiding as your new President over a meeting of this Society, you

will perhaps allow me to express my sincere thanks to the Fellows, only some of whom I met at the dinner the other evening, for the distinction they have bestowed upon me. I have always valued very greatly my connection with the Royal Geographical Society, not merely because a number of years ago it conferred upon me the highest honour at its disposal, an honour which I assure you I esteem far more highly than many of the political distinctions that have fallen to my lot; but during the time that has elapsed since first I served on the Council of the Society, twenty years ago, although, on account of other work, I have not been able to show as active an interest in the work of the Society as I should have desired, my feelings have always been warmly concerned in its welfare, since of all the scientific societies that exist in this country, the Royal Geographical Society strikes me as one which is doing work as good, as useful, and as beneficent as any. You can imagine, therefore, that it is a source of great pride to me to be elected to the highest office you have it in your power to give. It may be that, owing to other duties and calls which I cannot always resist, I shall be unable to devote quite as faithful attention to the work as some of my predecessors, and notably my immediate predecessor, Major Leonard Darwin, have done. But if I am at all remiss in this respect you must allow me to enter a plea for your indulgence, and I can assure you that I shall make as small a claim upon that forbearance as I possibly can.

The paper read was:—

"Some Explorations in the Himalayas." By Dr. Arthur Neve.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps, Eastern. **Grieben.**

Grieben's guide-books. Vol. 154. The Dolomites: a practical guide. Berlin (London: Williams & Norgate), 1911. Size 6½ × 4, pp. 148. *Maps and Plan. Price 3s. net. Presented by the Publishers.*

Belgium. **Boulger.**

Belgium of the Belgians. By Demetrius C. Boulger. London: Sir I. Pitman & Sons, 1911. Size 7½ × 5½, pp. vi. and 274. *Illustrations. Price 6s. net. Presented by the Publishers.*

France—Nord—Place-names. **Quarré-Prévost.**

B.G. Hist. et Descriptive 1910 (1911): 171–258.

Recherches sur les formes originales des noms de lieux dans l'arrondissement de Lille. Par L. Quarré-Prévost. *Maps.*

France—Paris. *La G., B.S.G. Paris* **23** (1911): 81–100. **Clouzot.**

Les inondations à Paris du VI^e^ au XX^e^ Siècle. Par Etienne Clouzot. *Plans and Illustrations.*

France—Poitou. *Rev. G. Annuelle* **3** (1909): 155–380. **Passerat.**

Les plaines du Poitou. Par Charles Passerat. *Sketch-maps, Diagrams, and Illustrations.*

A very complete regional study.

Germany—Oder basin. **Hellmann and Elsner.**

Veröffentlichungen des K. Preussischen Meteorologischen Instituts . . . Nr. 230. Meteorologische Untersuchungen über die Sommerhochwasser der Oder. Von G. Hellmann und G. v. Elsner. Berlin: Behrend und Co., 1911. Size 11½ × 8, pp. xii. and 236. *Separate Atlas of Maps (size 22 × 17; 50 plates).*

Germany—Phytogeography. **Ihne.**

Ueber Beziehungen zwischen Pflanzenphänologie und Landwirtschaft. Von Prof. Dr. Ihne. Zweite . . . Auflage. (Arbeiten der Deutschen Landwirtschafts-Gesellschaft, Heft 161.) Berlin, 1910. Size 9½ × 6½, pp. 44. *Maps.*

Germany—Surface forms. *G.Z.* **16** (1910): 690–694. **Hettner.**

Wüstenformen in Deutschland? Von Prof. Dr. A. Hettner.

Discusses the possible desert origin of some remarkable rock-formations in Saxony, Silesia, etc.

Germany—Vosges. **Häberle.**

Das Felsenland des Pfälzerwaldes (Pfälzischer Wasgenwald). Ein Beispiel für die Entstehung bizarrer Verwitterungsformen im Buntsandstein. Von Dr. Daniel Häberle. Verlagsabteilung des Pfälzerwald-Vereins. Kaiserslautern: H. Kayser, 1911. Size 9½ × 6½, pp. 24. *Illustrations. Price 1m. Presented by the Author.*

Germany—Würtemberg. **Baring-Gould.**

The land of Teck and its neighbourhood. By S. Baring-Gould. London: J. Lane, 1911. Size 9 × 6, pp. xii. and 328. *Sketch-map and Illustrations. Price 10s. 6d. net. Presented by the Publisher.*

Holland—Texel. **Kleinkemm.**

Die Insel Texel. Von Hugo Kleinkemm. Giessen, 1910. Size 9 × 6½, pp. 102. *Diagrams. Price 2s. 6d.*

An all-round study of the island's geography.

Holland—Tides. **Van der Stok.**

Études des Phénomènes de Marée sur les Côtes Néerlandaises. IV. Les Marées Principales. Par J. P. van der Stok. (Koninklijk Nederlandsch Meteorologisch Instituut, No. 90.) Utrecht, 1910. Size 10 × 6½, pp. 40. *Charts.*

Holland—Zuider See. **Beekman.**

Ts. K. Nederl. Aardr. Genoots. II. Ser. **28** (1911): 1–48.

Wat de afsluiting en droogmaking der Zuiderzee eigenlijk beteekent. Door A. A. Beekman. *Map.*

Iceland—Volcanoes. *Geol. Mag.* V. **8** (1911): 59–63. **Reck.**

Fissureless Volcanoes. By Dr. Hans Reck.

See note in the June number, p. 666.

Italy—Apennines. *B.S.G. Italiana* **11** (1910): 937–954. **Almagia.**

Alcuni fenomeni carsici nell' Abruzzo aquilano. Del prof. Roberto Almagià. *Sketch-map, Profile, and Illustrations.*

Italy—Dora Baltea. *Rev. G. Annuelle* **3** (1909): 381–391. **Argand.**

Une vallée tectonique. La Doire Baltée en aval d'Aoste. Par Emile Argand. *Sketch-map.*

Italy—Emigration. *Rev. G. Annuelle* **3** (1909): 525–549. **Rambaud.**

L'Emigration italienne. Aspects et résultats actuels. Par Jacques Rambaud. *Illustration.*

Montenegro. **Verloop.**

Le royaume de Monténégro. Par M. C. Verloop. Paris: Berger-Levrault, 1911. Size 10 × 6½, pp. 104. *Map. Price* 3 *fr. Presented by the Author.*

Northern Europe—Lakes. *La G., B.S.G. Paris* **23** (1911): 105–108. **Halbfass.**

Les cryptodépressions de l'Europe septentrionale. Par Wilhelm Halbfass.

Additions to and rectifications of previous lists of European lakes with beds below sea-level.

Norway—Hydrology. **River Board.**

Hydrologiske Meddelelser for Kongeriget Norge . . . utgit av Vasdragdirektøren. Vandstandsiagttagelser. Bind V.: Klara, Fredrikshaldsvasdraget og Mosselven 1907. Kristiania, 1910. Size 9½ × 6½, pp. vi. and 206.

Pyrenees. *La G., B.S.G. Paris* **23** (1911): 133–136. **Lemoine.**

Le panneau géologique des Pyrénées à l'exposition de Bruxelles. Par Paul Lemoine. *Sketch-map and Section.*

Rhine Basin—Deposits. **Fliegel.**

Verh. Naturhist. V. preuss. Rheinlande **66** (1909): 327–342.

Rheindiluvium und Inlandeis. Von Dr. G. Fliegel. *Sketch-map and Illustrations.*

Rumania—Ialomitza. *B.S.G. Romînă* **30** (1909): 65–72. **Panaitescu.**

O problemă geografică cu privire la văile Ialomița și Moștiștea. De Colonelul Sc. Panaitescu.

Russia—Finland—Sea-level.

Finnländische hydrographisch-biologische Untersuchungen, No. 4. Wasserstand-Registrierungen bei Hangö (Nördl. Br. 59° 49′, Länge 22° 56′ E. von Gr.) 1897–1903. Herausgegeben von der Meteorologischen Zentralanstalt. Helsingfors, 1909. Size 13 × 10, pp. xiv. and 86. *Diagrams.*

Gives the hourly records for the years 1897–1903.

Sweden—Lappland—Sarek mountains. **Hamberg.**

Naturwissenschaftliche Untersuchungen des Sarekgebirges in Schwedisch-Lappland, geleitet von Dr. Axel Hamberg. Eight parts, belonging to Vols. 1, 3, and 4. Stockholm: C. E. Fritze, 1907 and onwards. Size 10½ × 7. *Illustrations.*

To be completed in 4 vols. The title of each part will be entered separately.

Switzerland—Climate. *G.Z.* **16** (1910): 695–701. **Bach.**

Das Klima der Schweiz. Von Dr. Hugo Bach.

Switzerland—Geology. **Arbenz and Staub.**

Vierteljahrsschr. Naturfors. Ges. Zürich **55** (1910): 23–62.

Die Wurzelregion der helvetischen Decken im Hinterrheintal und die Ueberschiebung der Bündnerschiefer südlich von Bonaduz. Von Paul Arbenz und Walther Staub. *Sections.*

Switzerland—Phytogeography. **Neuweiler.**

Vierteljahrsschr. Naturfors. Ges. Zürich **55** (1910): 156–202.

Untersuchungen über die Verbreitung prähistorischer Hölzer in der Schweiz. Ein Beitrag zur Geschichte unseres Waldes. Von E. Neuweiler.

United Kingdom—Canals. **Dunwoody.**

Royal Commission on Canals and Waterways, vol. 10. Reports on the water supplies of canal routes, by R. B. Dunwoody to the Water Supply Committee of the Royal Commission appointed to inquire into and to report on the Canals and Inland Navigations of the United Kingdom. London, 1911. Size 13 × 8½, pp. xviii. and 242. *Maps. Price* 7*s.* 2*d. Presented by the Royal Commission.*

United Kingdom—Hampshire. **White.**

Memoirs of the Geological Survey. England and Wales. The Geology of the country around Alresford. By H. J. Osborne White. London, 1910. Size 9½ × 6, pp. 102. *Sections.*

United Kingdom—Ireland—Canals. **Royal Commission.**

Royal Commission on Canals and Waterways. Vols. 11 and 12. Final report (pp. xii. and 92) and Appendices (pp. iv. and 38) on the Canals and Inland Navigations of Ireland from the Royal Commission appointed to enquire into and to report on the Canals and Inland Navigations of the United Kingdom. London: Wyman & Sons, 1911. Size 13 × 8½. *Price* 10*d.* *and* 4½*d.* *Presented by the Royal Commission.*

These volumes conclude the Reports of the Commission.

United Kingdom—Ireland—Mayo. **Westropp.**

P.R. Irish A. **29** (1911): Sec. C, 11–33.

Notes on the larger cliff forts of the west coast of County Mayo. By Thomas Johnson Westropp. *Illustrations and Sections.*

United Kingdom—Kirkcudbright. **Newbigging.**

A nook in Galloway. By Thomas Newbigging. Gatehouse-of-Fleet, N.B.: J. R. & A. Kirkpatrick, 1911. Size 7 × 4½, pp. 100. *Illustrations. Price* 2*s. net. Presented by the Publishers.*

United Kingdom—Lancashire. **Wyld and Hirst.**

The place-names of Lancashire: their origin and history. By Henry Cecil Wyld and T. Oakes Hirst. London: Constable & Co., 1911. Size 9 × 6, pp. xxiv. and 400. *Price* 26*s. net. Presented by the Publishers.*

United Kingdom—Navy. **Chatterton.**

The story of the British Navy from the earliest times to the present day. By E. Keble Chatterton. London: Mills & Boon, [1911]. Size 9 × 5½, pp. xiv. and 372. *Facsimile Plans and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

United Kingdom—Text-book. **Brown and Johnson.**

The New Outlook Geography. The home of Man. Part I. The British Isles. By W. C. Brown and P. H. Johnson. London: G. G. Harrap & Co., 1911. Size 7½ × 5, pp. 344. *Sketch-maps and Illustrations. Price* 2*s.* 6*d. Presented by the Publishers.*

United Kingdom—Text-book. **Herbertson.**

Commercial geography of the British Isles. By Dr. A. J. Herbertson. 3rd edit. London: W. & R. Chambers, [1911]. Size 7 × 5, pp. 152. *Sketch-maps. Price* 1*s. Presented by the Publishers.*

ASIA.

Afghanistan. **Tate.**

The kingdom of Afghanistan: a historical sketch. By G. P. Tate. Bombay & London, etc., "Times of India," 1911. Size 10 × 6½, pp. x. and 224. *Maps. Presented by the Author.*

China—South-West. **Clarke.**

Among the tribes in South-West China. By Samuel R. Clarke. London: Morgan & Scott, 1911. Size 8 × 5½, pp. xviii. and 316. *Sketch-maps and Illustrations. Price* 3*s.* 6*d. net. Presented by the Publishers.*

French Indo-China. **Russier and Brenier.**

L'Indochine française. Par Henri Russier et Henri Brenier. Paris: A. Colin, 1911. Size 7½ × 5, pp. 356. *Maps and Illustrations. Price* 4 *fr. Presented by the Publishers.*

India. **Morison.**

The economic transition in India. By Sir Theodore Morison. London: John Murray, 1911. Size 8½ × 5½, pp. iv. and 252. *Price* 5*s. net. Presented by the Publisher.*

India—Historical. **Foster.**

The English factories in India, 1634–1636. A calendar of documents in the India Office, British Museum and Public Record Office. By William Foster. Published

under the patronage of H. M. Secretary of State for India in Council. Oxford: Clarendon Press, 1911. Size 9 × 6, pp. xl. and 356. *Illustration. Price* 12*s.* 6*d. net. Presented by the India Office.*

India—Historical. **Tilby.**

The English People overseas; vol. 2. British India, 1600–1628. By A. Wyatt Tilby. (2nd edit.) London: Constable & Co., 1911. Size 8 × 5½, pp. vi. and 286. *Price* 4*s.* 6*d. net. Presented by the Publishers.*

India—Madras—Ethnology. **Iyer.**

The Cochin tribes and castes. Vol. 1. By L. K. Anantha Krishna Iyer. Madras (London: Luzac & Co.), 1910. Size 9½ × 6, pp. xxx. and 366. *Illustrations. Price* 16*s. net.*

Japan—Mount Fuji. **Hayata.**

The vegetation of Mount Fuji, with a complete list of plants found on the mountain and a botanical map showing their distribution. By B. Hayata. Tokyo, etc., Z. P. Maruya & Co., 1911. Size 9 × 6, pp. 126. *Map and Illustrations. Price* 6*s. net.*

Malay Archipelago—Phytogeography. **Ernst.**

Vegetationsbilder (Karsten and Schenck) **7** (1909): Plates 1–12.

Die Besiedelung vulkanischen Bodens auf Java und Sumatra. Von Dr. A. Ernst. *Illustrations.*

Malay Archipelago—Sumatra. **Grubauer.**

Deutsche Rundschau G. **33** (1911): 73–79, 107–114, 153–159.

Gunung Si-Bajak. Reisebilder aus Ost-Sumatra. Von Alb. Grubauer. *Illustrations.*

Persia. *Petermanns M.* **57** (1911) [i.]: 65–70. **Strauss.**

Eine Reise im Westlichen Persien. Von Th. Strauss. *Map.*

Persia—Seistan. **Tate.**

Seistan: a memoir on the history, topography, ruins, and people of the country. By G. P. Tate. Parts 1–3. Calcutta: Superintendent of Government Printing, 1910. Size 12 × 9½, pp. vi. and 272. *Maps, Plans, and Illustrations. Price* 32*s. Presented by the Author.*

Philippine Islands—Luzon—Ethnology. **Barrows.**

Popular Sc. Monthly **77** (1910): 521–537.

The Ilongot or Ibilao of Luzon. By Dr. David P. Barrows. *Illustrations.*

Philippine Islands—Luzon—Flora. **Merrill and Merritt.**

Philippine J. Sc. **5** (1910): C; 287–404.

The Flora of Mount Pulog. By E. D. Merrill and M. P. Merritt. *Map, Chart, and Illustrations.*

Russia—Siberia—Geology. **Meister.**

Explorations géologiques dans les régions aurifères de la Sibéric. Carte géologique de la région aurifère d'Iénisséi. Description de la feuille I. 7. Par A. Meister. St. Petersburg, 1910. Size 10 × 6½, pp. 44. *Map, Index-map, and Section.* [In Russian; French *résumé.*]

Russia—Siberia—Geology. **Rippas.**

Explorations géologiques dans les regions aurifères de la Sibérie. Carte géologique de la région aurifère de la Zéia. Description de la feuille II. 1. Par P. Rippas. St. Petersburg, 1910. Size 10 × 6½, pp. 250. *Map, Index-map, and Section.* [In Russian; French *résumé.*]

Siam—Phytogeography. *Kew B.* (1911): 1–60. **Kerr and Craib.**

Contributions to the flora of Siam. By A. F. G. Kerr and W. G. Craib. *Illustration.*

Mr. Kerr sketches the vegetation of Chieng-mai, particularly of Mt. Doi Sutep; Mr. Craib gives a systematic list of Siamese plants.

Turkey—Palestine. **Huntington.**

Palestine and its transformation. By Ellsworth Huntington. London: Constable & Co., 1911. Size 8½ × 5½, pp. xviii. and 444. *Maps, Illustrations, and Diagrams. Price* 8*s.* 6*d. net. Presented by the Publishers.*

Turkey—Palestine. **Kent.**

Biblical geography and history. By Dr. Charles Foster Kent. London: Smith, Elder & Co., 1911. Size 8 × 5½, pp. xviii. and 296. *Maps and Plans. Price* 6*s. net. Presented by the Publishers.*

Turkey—Palestine—Dead sea. **Masterman.**

Palestine Explor. Fund: Quarterly Statement (1911): 12–27.

Three Early Explorers in the Dead Sea Valley. Costigan—Molyneux—Lynch. By Dr. E. W. G. Masterman.

Western Asia. **Grothe.**

Hugo Grothe. Meine Vorderasienexpedition 1906 und 1907. Band I.: Die fachwissenschaftlichen Ergebnisse (1. Teil). Leipzig: K. W. Hiersemann, 1911. Size 10½ × 7½, pp. xvi. and cclxxxiv. *Map, Plans, and Illustrations. Presented for the Author.*

AFRICA.

Egypt—Nubia—Archæology. **Randall-MacIver and Woolley.**

University of Pennsylvania: Publications of the Egyptian Department of the University Museum. Eckley B. Coxe Junior Expedition to Nubia. Vol. 1. Areika. By D. Randall-MacIver and C. Leonard Woolley. Oxford: H. Hart, 1909. Size 11½ × 8½, pp. viii. and 56. *Map, Plans, and Illustrations. Presented by the University of Pennsylvania Museum.*

Egypt—Nubia—Archæology. **Survey Department.**

Ministry of Finance, Egypt Survey Department. The Archæological Survey of Nubia. Report for 1907–08. 2 vols. (Vol. 1, Archæological Report, by George A. Reisner, pp. 374; Vol. 2, Report on the human remains, by G. Elliot Smith and F. Wood Jones, pp. 378.) Cairo, 1910. Size 14½ × 11. *Maps and Illustrations; also separate volumes of Plans and Illustrations. Price L.E. 4. Presented by the Survey Department, Egypt.*

A preliminary account of the work had previously appeared in the *Bulletins* of the Survey (see Review in the present number, p. 68).

Egypt—Sinai. **Rendall.**

Sinai in Spring, or the best desert in the world. By M. J. Rendall. London: J. M. Dent & Sons, 1911. Size 8½ × 5½, pp. xii. and 688. *Sketch-map and Illustrations. Price 4s. 6d. net. Presented by the Publishers.*

French West Africa—Dahome. **Le Herissé.**

L'ancien royaume du Dahomey: mœurs, religion, histoire. Par A. Le Herissé. Paris: E. Larose, 1911. Size 10 × 6½, pp. 384. *Sketch-map and Illustrations. Price 12 fr.*

German East Africa. *Deutsches Kolonialblatt* **22** (1911): 19–20. **Gunzert.**

Das westliche Usukuma zwischen Muansa-Golf und Ssimiju-Fluss. Von Gunzert. *Map.*

German East Africa—Meteorology. **Heidke.**

M. Deuts. Schutzgebieten **23** (1910): 251–342.

Meteorologische Beobachtungen aus Deutsch-Ostafrika. Teil V. Zusammenstellungen von Monats- und Jahresmitteln aus den Jahren 1907 und 1908 an 47 Beobachtungsstationen. Von Dr. P. Heidke.

German South-West Africa. *M. Deuts. Schutzgebieten* **23** (1910): 234–250. **Moritz.**

Die Tirashochfläche. Von Prof. Dr. Eduard Moritz. *Map.*

This district lies inland from Angra Pequeña, west of Bethany.

Kamerun—Vegetation. **Büsgen.**

Vegetationsbilder (Karsten and Schenck) **8** (1910): Plates 37–42.

Vegetationsbilder aus dem Kamerunergebirge. Von M. Büsgen. *Illustrations.*

Madagascar—Minerals. *Mem. S. Phys. Genève* **36** (1910): 283–410. **Duparc and others.**

Les minéraux des pegmatites des environs d'Antsirabé à Madagascar. Par Prof. Louis Duparc, M. Wunder et R. Sabot. *Illustrations and Sections.*

Morocco—Ujda. *La G., B.S.G. Paris* **23** (1911): 17–38. **Gentil.**

L'amalat d'Oujda. Etude de géographie physique. *Illustrations and Sections.*

Portuguese East Africa—Lourenço Marques.

The Delagoa Directory, 1911. A Year-Book of Information regarding the town and port of Lourenço Marques. Lourenço Marques: A. W. Bayly & Co., 1911. Size 8½ × 5½, pp. 158. *Presented by the Editor.*

Rhodesia. **British South Africa Company.**

The British South Africa Company: Directors' Report and Accounts for the year ended 31st March, 1910. London, 1911. Size 10½ × 8½, pp. 80. *Map.*

South Africa. **Bertrand.**

Dans le Sud-Africain et au seuil de l'Afrique Centrale. Par Alfred Bertrand. Geneva: J. H. Jeheber, [1911]. Size 8½ × 5½, pp. 72. *Illustrations. Presented by the Author.*

South Africa. **Durand.**

A holiday in South Africa. By Sir H. Mortimer Durand. Edinburgh, etc.: W. Blackwood & Sons, 1911. Size 7½ × 5, pp. xiv. and 276. *Sketch-map. Price 6s. net. Presented by the Publishers.*

Sudan—Geology. **Geology.**

Description géologique des régions situées entre le Niger et le Tchad et à l'Est et au Nord-Est du Tchad. Par le Dr. G. Garde. Paris: A. Hermann et Fils, 1911. Size 10 × 6½, pp. 284. *Maps, Illustrations, and Sections. Price 10 fr. Presented by the Author.*

Transvaal—Survey. **Mines Department.**

Union of South Africa, Mines Department. Report of the Geological Survey (Transvaal) for the year 1909. Pretoria, 1910. Size 11 × 8½, pp. 110. *Maps, Sections, and Illustrations. Presented by the Mines Department.*

West Africa—Fans. *Rev. G. Annuelle* **3** (1909): 497–524. **Martrou.**

Etude de géographie humaine. Le Nomadisme des "Fangs." Par Louis Martrou. *Sketch-map.*

West Africa—Missions. **Hawker.**

An Englishwoman's twenty-five years in tropical Africa: being the biography of Gwen Elen Lewis, missionary to the Cameroons and the Congo. By George Hawker. London: Hodder & Stoughton, [1911]. Size 8 × 5½, pp. xiv. and 352. *Sketch-map and Illustrations. Price 6s. Presented by the Publishers.*

NORTH AMERICA.

Mexico. **Department of Finance.**

The Mexican Year Book: a statistical, financial, and economic annual, compiled from official and other returns. 4th issue, 1911. Issued under the auspices of the Department of Finance. Mexico (London: McCorquodale & Co.), 1911. Size 9 × 5½, pp. viii. and 474. *Maps and Diagrams. Price 21s. net. Presented by the Publishers.*

United States—Connecticut—Geology. **Barrell and Loughlin.**

State of Connecticut; State Geological and Natural History Survey, Bulletin No. 13. The lithology of Connecticut. By Joseph Barrell and Gerald Francis Loughlin. Hartford, 1910. Size 9 × 6, pp. 208.

United States—Louisiana. *U.S. Geol. Surv., B.* **429** (1910): pp. 192. **Harris.**

Oil and gas in Louisiana, with a brief summary of their occurrence in adjacent States. By G. D. Harris. *Maps, Sections, and Illustrations.*

United States—Missouri—Antiquities. **Fowke.**

Bureau of American Ethnology. Bulletin 37. Antiquities of Central and South-Eastern Missouri. By Gerard Fowke. Washington, 1910. Size 9½ × 6, pp. 116. *Maps, Plans, Sections, and Illustrations.*

United States—New Mexico. **Meinzer.**

U.S. Geol. Surv., Water-supply Paper **260** (1910): pp. 34.

Preliminary report on the ground waters of Estancia Valley, New Mexico. By Oscar E. Meinzer.

United States—New York. *J.G.* **9** (1911): 119–124. **Whitbeck.**

Geographical Influences in the Development of New York State. By R. H. Whitbeck.

United States—Railways. *J.G.* **9** (1911): 113–118. **Parkins.**

A Comparison of the Trans-Appalachian Railroads. By A. E. Parkins. *Sketch-map and Diagrams.*

United States—South-West. *U.S. Geol. Survey, B.* **435** (1910): pp. 88. **Darton.**

A reconnaissance of parts of North-Western Mexico and Northern Arizona. By N. H. Darton. *Map, Diagrams, and Illustrations.*

United States—Wisconsin—Lakes. **Birge and Juday.**

The inland lakes of Wisconsin: the dissolved gases of the water and their biological significance. By Edward A. Birge and Chancey Juday. (Wisconsin

Geological and Natural History Survey, Bulletin No. 22.) Madison, Wis., 1911. Size 10 × 7, pp. xx. and 260. *Sketch-maps and Diagrams. Presented by the Authors.*

CENTRAL AND SOUTH AMERICA.

Argentine. **Larden.**

Argentine plains and Andine glaciers: life on an estancia, and an expedition into the Andes. By Walter Larden. London: T. Fisher Unwin, 1911. Size 9 × 6, pp. 320. *Sketch-map and Illustrations. Price* 14*s. net.*

Argentine. **Urien and Colombo.**

La República Argentina en 1910. Estudio histórico, físico, político, social y económico publicado bajo los auspicios de la H. Comisión del Centenario. . . . Por Carlos M. Urien y Ezio Colombo. 2 vols. Buenos Aires, 1910. Size 11 × 7½, pp. (vol. 1) xvi., 602, and 4; (vol. 2) 682. *Maps and Illustrations. Presented by the Comisión Nacional del Centenario.*

Brazil. **Cook.**

Through the wildernesses of Brazil by horse, canoe, and float. By William Azel Cook. London: T. Fisher Unwin, [1911]. Size 8½ × 6, pp. iv. and 488. *Illustrations. Price* 7*s.* 6*d. net.*

Central America. **Palmer.**

Central America and its problems. An account of a journey from the Rio Grande to Panama, with introductory notes on Mexico and her relations to her neighbours. By Frederick Palmer. London: T. Werner Laurie, [1911]. Size 8½ × 6, pp. xiv. and 348. *Map and Illustrations. Price* 10*s.* 6*d. net. Presented by the Publisher.*

Central America—Mosquito Coast. **Beltrán y Rózpide.**

B.R.S.G. Madrid **52** (1910): 438–460.

La Mosquitia. Algunas notas documentadas para la historia territorial de esta parte de Centroamérica. Por Ricardo Beltrán y Rózpide.

Chile—Geodesy. **Bertrand and Riso-Patron.**

Rapport sur les travaux géodésiques au Chile. Présenté à la 16me Conférence Générale de l'Association Géodésique Internationale, Londres, Septembre 1909. Par Alejandro Bertrand et Luis Riso-Patron. [N.P., N.D.] Size 11½ × 9, pp. 8. *Maps, Diagrams, and Illustrations.*

Cuba—Cartography. **Figarola-Caneda.**

Cartografía Cubana del British Museum. Catálogo cronológico de cartas, planos y mapas de los siglos XVI. al XIX. Por Domingo Figarola-Caneda. Segunda edición, corregida. Havana, 1910. Size 10½ × 7, pp. 22. *Presented by the Author.*

Paraguay. *M.G. Ges. Jena* **28** (1910): 1–9. **Carnier.**

Verkehrswege und Verkehrsmittel in Paraguay. Von K. Carnier.

Peru—Andes. **Société d'Etudes . . . Topographiques.**

Détermination de l'altitude du Mont Huascaran (Andes du Pérou), exécutée en 1909 sur la demande de Madame F. Bullock-Workman par la Société Générale d'Etudes et de Travaux Topographiques. Compte rendu de la Mission. Paris: H. Barrère, 1911. Size 15 × 11, pp. 48. *Maps, Section, and Diagrams. Presented by the Société d'Etudes . . . Topographiques.*

The result of these operations was referred to in vol. **35**, p. 458.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Marshall.**

Sunny Australia: impressions of the country and people. By Archibald Marshall. London: Hodder & Stoughton, [1911]. Size 8 × 5½, pp. xii. and 272. *Illustrations. Price* 6*s. Presented by the Publishers.*

New Guinea. *Ts. K. Nederl. Aardr. Genoots.* II. Ser. **28** (1911): 120–127. ———

Gouvernements-exploratie van Nieuw-Guinea.

The principal item is concerned with the work of the boundary commission in Northern New Guinea (vol. **37**, p. 452). Among others is an account of a reconnaissance of the upper Setekwa in the south.

New Guinea—Dutch. **Nouhuys.**

Toelichting bij de overzichtskaart 1:200,000 der Expeditie naar Centraal Nieuw-Guinea 1907 en 1909/1910 onder leiding von Mr. H. A. Lorentz. Door J. W. Van

Nouhuys. (Maatschappij ter bevordering van het Natuurkundik Onderzoek der Nederlandsche Koloniën. Bulletin No. 64.) [The Hague, 1910]. Size 8½ × 5½, pp. 8. *Map. Presented by the Author.*

Explanation of the methods of survey in the two Lorentz expeditions.

New Meklenburg—Ethnology. **Schlaginhaufen.**

Ein anthropologischer Querschnitt im Südosten von Neu-Mecklenburg. Von Dr. O. Schlaginhaufen. (Sonderabdruck aus dem "Korrespondenz-Blatt der Deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte," xli. Jahrg., Nos. 9–12, 1910.) Brunswick, [1910]. Size 11 × 8½, pp. 4. *Sketch-map and Diagrams.*

New South Wales. *Tour du Monde* **16** (1910): 541–636. **Privat-Deschanel.**

En Australie: La Nouvelle-Galles du Sud. Par M. Privat-Deschanel. *Sketch-map and Illustrations.*

The author has written much on Australia, of which he has made a special study.

New South Wales—Fisheries. **Stead.**

Department of Fisheries. New South Wales. A brief review of the Fisheries of New South Wales: Present and Potential. By David G. Stead. Sydney, 1910. Size 8½ × 5½, pp. 32. *Illustrations. Presented by the Board of Fisheries.*

Pacific—Savaii and Kilauea. *Popular Sc. Monthly* **77** (1910): 603–611. **Crampton.**

Two Active Volcanoes of the South Seas. By Professor Henry E. Crampton. *Illustrations.*

Pacific Ocean—Depths. **Henjes.**

Ein Beitrag zur Morphographie des Meeresbodens im südwestlichen Pazifischen Ozean. Von Friedrich Henjes. [Altenburg, 1910.] Size 11 × 9½, pp. 42. *Charts and Sections. Presented by the Author.*

Pacific Ocean—Soundings. *Ann. Hydrographie* (1911): 16–20. **[Dominik.]**

Tiefseelotungen S.M.S. *Planet* 1910 unter dem Kommando von Korvettenkapitän Dominik. *Charts.*

See March number, 1911, p. 321.

Papua. **Chignell.**

An outpost in Papua. By [the Rev.] Arthur Kent Chignell. London: Smith, Elder & Co., 1911. Size 8½ × 5½, pp. xii. and 376. *Illustrations. Price* 10*s.* 6*d. net. Presented by the Publishers.*

Samoa—Savaii. *Alpine J.* **25** (1910): 305–308. **Anderson.**

An Ascent of Matavanu in Savaii (German Samoa). By Dr. Tempest Anderson. *Illustrations.*

Samoa—Savaii. *Petermanns M.* **57** (1911) [i.]: 77–78. **Schmittmann.**

Der Feuersee auf Sawaii (Deutsch-Samoa). Von Dr. J. Schmittmann. *Illustrations.*

POLAR REGIONS.

Antarctic—French Expedition. **Charcot.**

The voyage of the *Why Not?* in the Antarctic: the journal of the Second French South Polar Expedition, 1908–1910. By Dr. Jean Charcot. London: Hodder & Stoughton, [1911]. Size 10 × 7½, pp. viii. and 316. *Sketch-map and Illustrations. Price* 20*s. net. Presented by the Publishers.*

The French edition was reviewed in vol. **37**, p. 310.

Antarctic—French Expedition. *La G., B.S.G. Paris* **23** (1911): 5–16. **Charcot.**

L'expédition antarctique française 1908–1910. Relation sommaire et résumé des travaux. *Map.*

Arctic—Spitsbergen. **De Geer.**

K. Svenska Vetenskaps-A. Handlingar **45** (1910): No. 9, pp. 64.

Zoologische Ergebnisse der Schwedischen Expedition nach Spitzbergen 1908 unter Leitung von Prof. G. de Geer. Eine Untersuchung über die Bodenfauna des Eisfjords nebst einer Uebersicht über das Plankton und die hydrographischen Verhältnisse. Redigiert von N. von Hofsten und S. Bock. Teil I.—Hydrographie und Plankton. *Maps and Sections.*

Arctic—Spitsbergen—Fossil wood. **Gothan.**

K. Svenska Vetenskaps-A. Handlingar **45** (1910): No. 8, pp. 56.

Die fossilen Holzreste von Spitzbergen. Von W. Gothan. *Illustrations.*

Greenland. *Meddelelser om Grønland* **34** (1910): 155–251. **Engell.**
Beretning om Undersøgelserne af Jakobshavns-Isfjord og dens Omgivelser fra Foraaret 1903 til Efteraaret 1904. Af M. C. Engell. *Maps.*

Greenland—Geology. *Meddelelser om Grønland* **34** (1910): 115–154. **Steenstrup.**
Geologiske og antikvariske Iagttagelser i Julianehaab Distrikt. Af K. J. V. Steenstrup. *Sketch-maps and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Cartography—Map collections. **Groll.**
Petermanns M. **57** (1911) [i.]: 199–201, 256–257.
Die wichtigsten Kartensammlungen von Berlin. Von Dr. M. Groll.

Cartography—Projections. *Petermanns M.* **57** (1911) [i.]: 255–256. **Maurer.**
Gegenazimutale Projektionen. Von Prof. Dr. H. Maurer. *Map.*

Chronometer. *Scottish G. Mag.* **27** (1911): 91–93. ———
Homan's Solar Chronometer. *Illustration.*
An apparatus to serve as a sundial, with a correction for the equation of time.

Meteorology—Atmosphere. **Vialay.**
Contribution à l'étude des relations existant entre les circulations atmosphériques, l'électricité atmosphérique et le magnétisme terrestre. Par Alfred Vialay. Paris: H. Dunod et E. Pinat, 1911. Size 10 × 6½, pp. viii. and 204. *Price* 6 *fr. Presented by the Author.*

Navigation. **Edmonds.**
Course angle tables for finding course made good, the set and drift of current being unknown, by means of three equidistant bearings of any conspicuous fixed point or light. By H. H. Edmonds. Sydney: Turner & Henderson, 1910. Size 6½ × 5, pp. 40. *Diagrams. Presented by A. J. Vogan, Esq.*

Navigation—Historical. *B.G. Hist. et Descriptive* 1910 (1911): 92–107. **Anthiaume.**
L'enseignement de la Science nautique au Havre-de-Grâce pendant les XVI^e^, XVII^e^ et XVIII^e^ Siècles. Par l'abbé A. Anthiaume.

Tides. **Ruthven.**
Moxly's theory of the tides, with a chapter of extracts from Moxly's original work. By J. T. Ruthven. Revised edition. London: J. D. Potter, 1911. Size 9½ × 6, pp. 104. *Diagrams. Presented by the Author.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Gravity. *American J. Sc.* **31** (1911): 1–18. **Bauer.**
On gravity determinations at sea. By L. A. Bauer.

Hydrology. *Ann. G.* **19** (1910): 385–411. **Baulig.**
Ecoulement fluvial et dénudation. D'après les travaux de l'United States Geological Survey. Par Henri Baulig. *Maps and Diagrams.*
The writer attempts to draw conclusions from the *data* contained in recent papers issued by the Hydrological Department of the U.S. Geological Survey.

Hydrology. *B.G. Hist. et Descriptive* 1910 (1911): 135–170. **Buffault.**
L'influence des forêts sur l'alimentation des sources et le régime des cours d'eau. Par Paul Buffault.

Icebergs. *Z. Gletscherkunde* **5** (1910): 122–132. **Engell.**
Ueber die Entstehung der Eisberge. Von M. C. Engell. *Diagrams and Illustrations.*

Magnetism. *Science* **33** (1911): 41–54. **Bauer.**
The Broader Aspects of Research in Terrestrial Magnetism. By [Dr.] L. A. Bauer.

Meteorology. **Heiskell.**
U.S. Department of Agriculture. Weather Bureau. Instructions to the Marine Meteorological Observers of the U.S. Weather Bureau. 3rd edit. By Henry L. Heiskell. Washington, 1910. Size 9 × 6, pp. 68. *Chart, Illustrations, and Diagrams.*

Steppes. *B.S.G. Lyon*, Ser. II. **4** (1911): 1–19. **Lager.**
Les steppes de l'Ancien Monde. Par Etienne Lager.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Vallaux.**

Géographie sociale: le sol et l'état. Par Camille Vallaux. (Encyclopédie scientifique . . . Bibliothèque de Sociologie.) Paris: O. Doin et fils, 1911. Size 7 × 4½, pp. 420. *Sketch-maps. Price 5 fr. Presented by the Publishers.*

Commercial—Minerals. *Science* **33** (1911): 1–16. **Kemp.**

Geology and Economics. By [Professor] James F. Kemp.

Mainly concerned with the husbanding of mineral resources.

Commercial—Telegraphs. **Bright.**

Imperial telegraphic communication. By Charles Bright. London: P. S. King & Son, 1911. Size 7½ × 5, pp. xxiv. and 212. *Map. Price 3s. 6d. net. Presented by the Publishers.*

Commercial—Textiles. *La G., B.S.G. Paris* **23** (1911): 109–132. **Clerget.**

La géographie des textiles. Par Pierre Clerget. *Diagrams.*

Commercial—Trade routes. *J. Manchester G.S.* **26** (1910): 1–20. **Kalisch.**

Trade Routes: Past and Present—East and West. By Richard Kalisch. *Illustrations.*

Ethnology—Games. **Haddon.**

Cat's cradles from many lands. By Kathleen Haddon. London: Longmans & Co., 1911. Size 8 × 5, pp. xvi. and 96. *Illustrations. Price 2s. 6d. net. Presented by the Publishers.*

Ethnology—Languages. **Dugout.**

Henri Dugout, S.J. Atlas philologique élémentaire. Essai de classification géographique des langues actuellement parlées. Shanghai: T'ou-sè-wè Press (London: Luzac & Co.), [1910]. Size 10 × 6, pp. vi. and 104. *Maps. Price 6s. Presented by the Publishers.*

Historical Geography. **Mackinder.**

The nations of the modern world: an elementary study in geography. By H. J. Mackinder. London: G. Philip & Son, [1911]. Size 7½ × 5, pp. xvi. and 320. *Maps and Illustrations. Price 2s. Presented by the Publishers.*

Military Geography. **MacDonnell.**

The outlines of military geography. By Colonel A. C. MacDonnell. London: H. Rees, Ltd., 1911. Size 8½ × 5½, pp. xiv. and 228. *Maps (in separate vol.). Price 12s. 6d. net. Presented by the Publishers.*

BIOGRAPHY.

Drake. **Eliott-Drake.**

The family and heirs of Sir Francis Drake. By Lady Eliott-Drake. 2 vols. London: Smith, Elder & Co., 1911. Size 9½ × 6½, pp. (vol. 1) xii. and 440; (vol. 2), vi. and 418. *Portraits and Illustrations. Price 31s. 6d. net. Presented by the Publishers.*

Uzielli. *B.S.G. Italiana* **12** (1911): 505–511. **Baratta.**

Gustavo Uzielli, 1839 maggio 29.—1911 marzo 7. Note biografiche del Prof. Mario Baratta.

Prof. Uzielli, whose death was due to an accident, was best known as a writer on the Italian geographers of the Renaissance.

GENERAL.

Education—Maps. **White.**

How to use contour hand-maps for class teaching; suggestions for practical exercises. By J. A. White. London: G. Philip & Son, [1911]. Size 8½ × 5½, pp. 8. *Map. Price 6d. Presented by the Publishers.*

Education—Text-book. **Chute.**

Geography notes: Part I. The British Isles (pp. 32); Part IV. America (Non-British) (pp. 26). By J. C. Chute. London: J. M. Dent & Sons, 1911. Size 8 × 6. *Sketch-maps, Sections, and Diagrams. Price (each part) 8d. Presented by the Publishers.*

Education—Text-book. **Reynolds.**

Elementary regional geography. Europe and the Mediterranean region. By J. B. Reynolds. London: A. & C. Black. Size 7 × 4½, pp. viii. and 184. *Sketch-maps and Illustrations. Price* 1*s.* 6*d. Presented by the Author.*

Geography—Essays. **Davis.**

Geographical essays. By William Morris Davis; edited by Douglas Wilson Johnson. Boston and London: Ginn & Co. (1909). Size 8½ × 5½, pp. vi. and 778. *Sketch-maps, Sections, and Diagrams. Price* 12*s.* 6*d. net.*

A collection of twenty-six characteristic studies, published in various periodicals between 1889 and 1909.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Belgium. **Geographical Section, General Staff.**

Belgium and the north-east of France. Drawn by the Geographical Section, General Staff, War Office. Scale 1 : 380,160 or 1 inch to 6 stat. miles. London: E. Stanford; Sifton Praed; T. Fisher Unwin, 1910. *Presented by the Director of Military Operations.*

Belgium. **Deventer.**

Atlas des Villes de la Belgique au XVI^e^ Siècle. Cent plans du Géographe Jacques de Deventer reproduits en facsimilé chromographique par l'Institute National de Géographie, à Bruxelles. Publication commencée par feu Ch. Ruelens et continuée sous la direction de Em. Ouverleaux et J. Van den Gheyn, S.J. 18^e^ Livraison. Brussels: M. Weissenbruch and Falk Fils, [1911].

Jacques de Deventer's sixteenth-century plans of towns of Belgium, which are now being published in facsimile by the Institut National de Géographie, Brussels, form a most interesting collection, and are of considerable historical importance; they should be carefully inspected in connection with the text which has been written to accompany them. The present part of the atlas contains plans of Dinant, Fauquemont, le Quesnoy, and Marche.

British Isles—England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from May 1 to 31, 1911.

4 miles to 1 inch scale maps:—

England. 2nd edit. Engraved in Outline. Sheet (21 and 25). *Price* 1*s.* 6*d.*

1-inch scale maps:—

England. 3rd edit. Engraved in Outline. Sheet 112. *Price* 1*s.*

Ditto. 3rd edit. Engraved, with hills brown or black. Sheets: 195, 213, 228. *Price* 1*s. each.*

Ditto. 4th edit. Engraved in Outline. Sheet 274. *Price* 1*s.*

Ditto. 4th edit. Engraved, with hills brown or black. Sheet 273. *Price* 1*s.*

Large-sheet series, printed in colours, and folded in cover or flat in sheets.

Special map of Felixstowe District, parts of sheets 87, 99. *Price, on paper,* 1*s.* 6*d.; mounted on linen,* 2*s.; mounted in sections,* 2*s.* 6*d.*

6-inch—County maps:—

Cheshire, 11 sheets. **Hampshire,** 1 sheet. **Sussex,** 2 sheets. **Yorkshire,** 4 sheets. *Price* 1*s. each.*

25-inch—County maps:—

Berkshire, 19 sheets. **Cheshire,** 21 sheets. **Hampshire,** 35 sheets. **Lancashire,** 38 sheets. **Sussex,** 30 sheets. **Yorkshire,** 57 sheets. *Price* 3*s. each.*

(*E. Stanford, London Agent.*)

British Isles—Scotland. **Johnston.**

W. & A. K. Johnston's "Three Miles to Inch" Map of Scotland. Sheets: 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14. Edinburgh and London: W. & A. K. Johnston, [1911]. *Price, mounted on cloth to fold,* 2*s.* 6*d. each sheet. Presented by the Publishers.*

This map was first published in outline, but has now been greatly improved by the addition of colour tints to show heights of land and depths of water. On the land the contours selected for the tints are: sea-level to 300, 300–500, 500–800, 800–1000, 1000–1500, 1500–2000, 2000–2500, and over 2500. As regards the higher lands, the effect of the tints selected is very satisfactory, and in general conformity with the system adopted for the 1:1,000,000 International map of the World; but the green for the lower lands is somewhat crude, and there is not sufficient gradation between this and the next tint. Depths of water in feet are shown in three shades of blue, 0–100, 100–200, and over 200. Roads are well marked, and their character distinguished. This map will doubtless be useful to tourists and motorists.

France. **Service Géographique de l'Armée, Paris.**

Carte de France. Scale 1:50,000 or 1·3 inch to 1 stat. mile. Sheet XXXV.–19, Remiremont. Paris: Service Géographique de l'Armée, 1911. *Price* 1.60 *fr. each sheet.*

The first sheet, issued as a specimen, of a map of France specially prepared for the use in aeronautical navigation. The object has been to represent important features in a bold diagrammatic style by symbols and colours, so that they can be readily distinguished. Woods, roads, railways, airship and aeroplane stations, dangerous landing-places, forts, windmills, and other prominent objects are all indicated by clear symbols. The mean magnetic declination for the area is also shown. This sheet is issued tentatively, and whether the map for the whole of France is completed in this manner is a matter that will be considered later.

Germany. **Königl. Sächs. Generalstab.**

Karte des Deutschen Reiches. Königreich Preussen. Herausgegeben von der Abteilung für Landesaufnahme des Königl. Sachs. Generalstabes. Scale 1:100,000 or 1 inch to 1·6 stat. mile. Sheet: 391, Oschatz. Dresden: G. A. Kaufmann, 1911. *Price* 1.50*m. each sheet.*

Italy. **Agostini.**

Carta Fisico-Politica del Regno d'Italia. [Del Dr. G. de Agostini.] Scale 1:3,000,000 or 1 inch to 47·3 stat. miles. Novara: Istituto Geografico de Agostini, [1911]. *Price* 0.30*L. Presented by the Publishers.*

Italy. **Agostini.**

Carta Politico-Administrativa del Regno d'Italia colle linee ferroviarie e di navigazione. [Del Dr. G. de Agostini.] Scale 1:2,000,000 or 1 inch to 31·5 stat. miles. Novara: Istituto Geografico de Agostini, [1911]. *Price* 1.50*L. Presented by the Publishers.*

Italy—Turin. **Agostini.**

Carta Topografica dei Dintorni di Torino. [Del Dr. G. de Agostini.] Scale 1:50,000 or 1·3 inch to 1 stat. mile. Novara: Istituto Geografico de Agostini, [1911]. *Price* 1.00*L. Presented by the Publishers.*

Sweden. **Hydrographic Bureau, Stockholm.**

Hydrografisk öfversiktskarta öfver Sverige. Utgifven af Hydrografiska byrån. Scale 1:1,500,000 or 1 inch to 23·6 stat. miles. Stockholm: Generalstabens Litografiska Anstalt, 1911. *Presented by the Hydrographic Bureau, Stockholm.*

Shows the river systems and drainage basins of Sweden by different colours, which have been selected so that the relative areas of the basins can be seen at a glance.

ASIA.

Celebes. **Abendanon.**

Zentral-Celebes. Reisen der Expedition der Kgl. Niederländischen Geograph. Gesellschaft in den Jahren 1909 u. 1910. Ausgeführt von E. C. Abendanon. Scale 1:1,000,000 or 1 inch to 15·8 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1911, Tafel 43. Gotha: Justus Perthes, 1911. *Presented by the Publisher.*

China. **China Inland Mission.**

A map of China prepared for the China Inland Mission, 1911. Scale 1:3,000,000 or 1 inch to 47·3 stat. miles. London: China Inland Mission and Edward Stanford, 1911.

A revised edition of the map referred to in the *Geographical Journal* for September, 1909, with corrections to date.

China. **China Inland Mission.**

A map of China prepared for the China Inland Mission. Scale 1:6,000,000 or 1 inch to 94·7 stat. miles. London: China Inland Mission, 1911. *Price* 2*s.* 6*d. net. Presented by the China Inland Mission.*

A small general map of China with boundaries of provinces coloured, and stations where there is a resident missionary underlined in red.

Indian Government Surveys. **Surveyor-General of India.**

Districts maps. Scale 1 inch to 4 miles: Gujrat, Jessore, Nimar, Rajshahi. Degree sheets, scale 1 inch to 4 miles: Burma, 1 sheet. Standard sheet, scale 1 inch to 1 mile: Bengal, 5 sheets; Bengal and Eastern Bengal and Assam, 1 sheet: Eastern Bengal and Assam, 1 sheet; Burma, 2 sheets; Central Provinces, 7 sheets; Madras and Coorg, 1 sheet; North-West Frontier Province, 1 sheet; Punjab, 1 sheet; Punjab, Baluchistan and North-west Frontier Province, 1 sheet; Hyderabad, 2 sheets. Calcutta: Survey of India, Map Record and Issue Office, 1911. *Presented by the Surveyor-General of India.*

Russia-Caucasia. **Military Topographical Section, Tiflis.**

Map of Caucasia and adjacent parts of Turkey and Persia. [In Russian.] Scale 1:209,722 or 1 inch to 3·3 stat. miles. Sheets: A 2; Б 1, 2, 4; В 1, 2; Г 1, 2, 7; А 4, 5, 6, 7, 8, 9; Е 2, 3, 4, 5, 6, 8, 10; Ж 3, 4, 6, 7, 8, 9, 10; З 5, 6, 7, 10; И 7, 9, 10. Tiflis: Military Topographical Section, 1896–1910.

These are the latest editions of 36 sheets of the 5-verst Russian Military Staff map of Caucasia, corrected up to various dates between 1899 and 1909. The total number of sheets is 89, so that those now received cover less than half of the whole area included in the survey. With the exception of the Elbruz district, they embrace the entire main range of the Caucasus. For years past Russian officers have been engaged in surveying and correcting previous surveys in this region, and the results of their work, generally produced in the first place on the scale of 1 verst to an inch, are excellent. These surveys have been utilized in the revision of these sheets, although, as might be expected, a considerable amount of detail has been lost in the reduction. A comparison of the peaks and glaciers of the main range as now delineated with the manner in which they were indicated on the earlier sheets, is interesting. Although not altogether satisfactory as regards relief, there is a vast improvement, due not merely to more correct surveys and better knowledge of the region, but to more intelligent methods of representing topographical features. The above-mentioned sheets include, in addition to the chain of high peaks and glaciers, parts of the north-west and south-east Caucasia, although little revision has been done to most of these, and they remain much as they were in the earlier edition.

According to the title and index, it is intended to include the adjacent portions of Turkey and Persia, but so far this has not been done, and the parts over the Russian frontier are left blank.

AFRICA.

Africa. **Survey Office, Khartum.**

Map of Africa. Scale 1: 250,000 or 1 inch to 3·9 stat. miles. Egyptian Sudan. Sheets: 45–E, Debba; 45–F, Merowe; 45–I, Soteir; 54–L, El Gleit; 55–M, J. Daier; 66–A, J. Tandik; 66–B, Renk; 66–C, Roseires; 66–E, J. Eliri; 66–F, Kaka; 66–I, Lake No; 66–J, Lower Sobat; 66–M, Hillet Nuer; 66–N, Middle Sobat; 66–O, Nasser. Khartum: Survey Office, 1910–1911. *Price* 10 P.T. *each sheet. Presented by the Director of Surveys, Survey Department, Khartum.*

Cameroons. **Moisel.**

Karte von Kamerun, bearbeitet von M. Moisel. Scale: 1: 300,000 or 1 inch to 4·7 stat. miles. Sheets: G 3, Dume-Station; H 3, Lomië. Berlin: Dietrich Reimer (Ernst Vohsen), 1910. *Price* 2*m. each sheet. Presented by the Publisher.*

Sheet G 3 adjoins H 3 to the north, and together the two sheets include the area extending from lat. 2° to 5° N., and from long. 12° to 14° E. A list of the route traverses made use of in the compilation is given with each sheet.

Cape of Good Hope. **Geological Survey, Cape Town.**

Geological map of the Province of the Cape of Good Hope. Scale 1: 238,000 or 1 inch to 3·7 stat. miles. Sheets: 11, Clanwilliam; 13, Beaufort West, Fraserburg. Cape Town: Geological Commission, 1911. *Presented by the Director, Geological Survey, Cape Town.*

Central Africa. **Laughans.**

Die neue Grenze zwischen Belgisch-Kongo u. Deutsch-Ostafrika nach dem Vertrage vom 11. August 1910. Scale 1: 750,000 or 1 inch to 11·8 stat. miles.

Petermanns Mitteilungen, Jahrgang 1911, Tafel 46. Gotha: Justus Perthes, 1911. *Presented by the Publisher.*

Shows the boundary between Belgian Congo and German East Africa to the north of Lake Tanganyika, according to the agreement of August 11, 1910. In addition to this, the limits of the British claim, and other lines are shown.

German East Africa. **K. Gouvernement von Deutsch-Ostafrika.**

Usambara- und Küstengebiet in den Bezirken Tanga, Pangani und Wilhelmstal. Herausgegeben vom Kaiserlichen Gouvernement von Deutsch-Ostafrika. Scale 1: 100,000 or 1 inch to 1·6 stat. mile. Sheet A. Berlin: Dietrich Reimer (Ernst Vohsen), [1911]. *Price 6m. each sheet.*

The south-east sheet of a map which, when complete, will consist of four sheets, and include Usambara and the coast district of German East Africa between the Umba and Pangani rivers. The map is based on recent reliable surveys, and the heights are effectively shown by contours and shading. Much information is given concerning the vegetation of the region by means of colours and symbols. The relative importance and size of villages as shown by the number of huts, means of communication, and spelling of native names, have all received careful attention.

Liberia. **Groll.**

Grenzgebiet Liberias östlich des St. Paul River. Bearbeitet von Dr. M. Groll. Scale 1 : 150,000 or 1 inch to 2·3 stat. miles. From *Leo Frobenius: Auf dem Wege nach Atlantis.* Berlin, 1911. *Presented by Dr. M. Groll.*

Liberia. **Volz and Groll.**

Reisewege von Dr. W. Volz durch das Hinterland von Liberia. Nach seinen Originalaufnahmen gezeichnet von Dr. M. Groll. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. From *XXII. Jahresbericht der Geographischen Gesellschaft von Bern*, Tafel vii. Bern: A. Francke, 1911. *Presented by Dr. M. Groll.*

Tunis. **Babelon, Cagnat, and Reinach.**

Atlas Archéologique de la Tunisie. Edition spéciale des cartes topographiques publiées par le Ministère de la Guerre accompagnée d'un text explicatif par MM. E. Babelon, R. Cagnat, S. Reinach. 13e Livraison. Paris: Ernest Leroux, 1911.

A continuation of an interesting atlas, consisting of the sheets of 1 : 50,000 French Government Survey of Tunis, with ancient sites and archæological information superimposed in red. The present are the Chebba, Kef, Suk el Kremis, and Gafsa sheets, each of which is accompanied by letterpress.

AMERICA AND WEST INDIES.

Argentine Republic. **Biedma and Beyer.**

Atlas Historico de la República Argentina. Recopilado y redactado por José Juan Biedma y dibujado por Cárlos Beyer. Buenos Aires: Angel Estrada y Cia., 1909. *Presented by the Comisión Nacional del Centenario.*

To all interested in the history of South America, and of the Argentine Republic in particular, this atlas will receive a ready welcome. By a series of nineteen plates of excellent coloured maps and plans, accompanied by descriptive and explanatory letterpress, it sets forth the leading events connected with the country from the time of its discovery and conquest by the Spaniards to the campaigns against the Indians and struggles with neighbouring states during the last century. Not the least interesting part to students is that dealing with the struggle for independence, while in this country the plans connected with the British occupation should have special importance. As the history of the Argentine Republic is so interwoven with that of other parts of South America, as might be expected, the earlier maps in the atlas are general in character, and deal with the early Spanish discoveries and conquests as a whole. Among these, as among the later ones, will be found some particularly interesting and instructive.

Brazil. **Jannasch.**

Spezialkarte von Santa Catharina, Rio Grande do Sul und Uruguay. Nach den neuesten quellen bearbeitet, herausgegeben von Dr. R. Jannasch-Ausgabe 1907, nachgesehen und vervollstandigt bis 1 Mai 1911. Scale 1: 1,000,000 or 1 inch to 15·8 stat. miles. Berlin: Leopold Kraatz, 1911.

A revised and corrected edition of a useful map of Southern Brazil and Uruguay, first published in 1907. Much of the region included is very imperfectly mapped, but the best available information has been utilized in the compilation.

Canada. **Dept. of the Interior, Ottawa.**

Standard Topographical Map of Canada. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheet 3 N.W. Kingston, Ontario. Ottawa: Department of the Interior, 1911. *Presented by the Department of the Interior, Ottawa.*

Canada. **Dept. of the Interior, Ottawa.**

Map of Manitoba, Saskatchewan, and Alberta. Scale 1: 792,000 or 1 inch to 12·5 miles. Special edition showing disposition of lands. Corrected to January 1, 1911. Prepared in the Railway Lands Branch. 9th edition. 3 sheets. Ottawa: Department of the Interior, 1911. *Presented by the Department of the Interior, Ottawa.*

West Indies—Curaçao. **Seyffardt.**

Kaart van het Eiland Curaçao benevens een plan van de Stad en Haven. Met toestemming van het Departement van Koloniën bewerkt naar de Topografische Kaart. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Amsterdam: Seyffardt's Boekhandel, 1911.

This map is based upon the recent survey of the island on the scale of 1 : 20,000, which was noticed in the *Geographical Journal* for June, 1911. A plan of Willemstad and St. Anna Baai is given as an inset on the 1 : 20,000 scale.

AUSTRALIA.

New South Wales. **Dept. of Lands, Sydney.**

Map of the City of Sydney, New South Wales, 1910. Compiled and drawn at the Department of Lands. Scale 1 : 6336 or 10 inches to 1 stat. mile. 2 sheets. Sydney: Department of Lands, 1910.

Victoria. **Dept. of Lands and Survey, Melbourne.**

Victoria. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. Compiled at the Department of Lands and Survey, under the direction of J. M. Reed, I.S.O., Surveyor-General. Melbourne: Department of Lands and Survey, 1910.

GENERAL.

Scripture Atlas. **Guthe.**

Bibelatlas in 20 Haupt- und 28 Nebenkarten. Von Hermann Guthe. Mit einem Verzeichnis der alten und neuen Ortonamen. Leipzig: H. Wagner and E. Debes, 1911.

A new atlas for Bible students embodying the results of the latest geographical surveys and archæological researches. There are altogether 20 sheets of coloured maps with numerous insets, which contain a large amount of information. During recent years so many discoveries have been made and fresh light thrown on sites of places mentioned in the Scriptures, that an atlas of this kind will be appreciated.

World. **Kiepert.**

Henrici Kiepert: Formæ Orbis Antiqui. 36 Karten mit kritischem Text und Quellenangabe bearbeitet und herausgegeben von Richard Kiepert. VI. Palæstina; XXXV. Europa et oræ maris interni secundum Ptolemæum. Berlin: Dietrich Reimer (Ernst Vohsen), [1911]. *Price per sheet with text, 3m. Presented by the Publisher.*

This part contains the following maps: VI. Palæstina, XXXV. Europa et oræ maris interni secundum Ptolemæum. Twenty of the thirty-six maps of which this excellent ancient atlas will consist have now been published, and the high standard of the earlier maps has been well maintained throughout. The results of all the geographical and archæological explorations have been taken advantage of in the preparation of the maps, which will be most valuable to all students of history and historical geography.

World. **Petrie and Schokalsky.**

Marck's Large General Table Atlas. Edited by Prof. E. J. Petrie and General J. de Schokalsky. [In Russian.] 2nd edition. St. Petersburg: A. F. Marcks, 1910. *Presented by Colonel J. D. Schokalsky.*

The first edition of Marck's general atlas, edited by Prof. E. J. Petri and General J. de Schokalsky, and based to a large extent on that of Wagner and Debes, of Leipzig, appeared in parts during the years 1904–05, and soon won for itself a high reputation, owing to the excellent character of the maps, and the style in which it was produced. A new edition of the work was published last year, under the superintendence of General J. de Schokalsky, who has revised the previous maps and

added three other entirely new ones, which are quite up to the standard of the others, and increase the usefulness of the atlas. These are the North Polar regions, Star charts and astronomical diagrams, and Palestine. It would perhaps be an advantage if a few other maps could be added, such, for instance, as Canada, which only appears on the map of North America, except parts of the country that happen to be included on the map of the United States, and Australia, of which no map is given besides one on a very small scale, including also Polynesia and the greater part of the Western Pacific. However, this is a Russian atlas, and certainly that empire is well represented by a fine sixteen-sheet map of European Russia on the scale of 1 : 2,000,000, in addition to other smaller maps, and a two-sheet map of Asiatic Russia on the 1 : 10,000,000 scale. This new edition has taken four years to prepare, and Colonel de Schokalsky may be congratulated on the result of his undertaking. Still, it is perhaps due to the fact that the revision has been so long in hand that some of the maps are now not quite up to date. For instance, Korea is shown as an independent country on maps No. 47 and No. 52. On the map of Equatorial Africa the boundary between Uganda and Belgian Congo is again given as following the 30th meridian, which is shown as passing through Lake Edward, as on earlier maps; and on the map of South America in several instances the boundaries are not correctly laid down. These are, after all, matters that can easily be set right on another issue, and taken as a whole the atlas is a most creditable production, and should prove serviceable to Russian-speaking people. A very full index to place-names adds considerably to its value for purposes of reference.

CHARTS.

America. **U.S. Weather Bureau.**

Meteorological charts of the Great Lakes, June, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Atlantic Ocean. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, May, 1911; ditto South Atlantic Ocean, June, July, and August, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Atlantic Ocean. **U.S. Weather Bureau.**

Meteorological chart of the North Atlantic Ocean, June, July, 1911; ditto South Atlantic Ocean, June, July, August, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly Meteorological Charts of the North Atlantic and Mediterranean, May, June, 1911. London: Meteorological Office, 1911. *Presented by the Meteorological Office.*

Indian Ocean. **Meteorological Office.**

Monthly Meteorological Charts of the Indian Ocean, May, June, 1911. London: Meteorological Office, 1911. *Presented by the Meteorological Office.*

Indian Ocean. **U.S. Weather Bureau.**

Meteorological chart of the Indian Ocean, June, July, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Pacific Ocean. **U.S. Weather Bureau.**

Meteorological chart of the North Pacific Ocean, June, July, 1911; ditto, South Pacific Ocean, June, July, August, 1911. Washington: Department of Agriculture, U.S. Weather Bureau, 1911. *Presented by the U.S. Weather Bureau.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, June, July, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

Pacific, South. **U.S. Hydrographic Office.**

Pilot chart of the South Pacific Ocean, June, July, August, 1911. Washington: U.S. Hydrographic Office, 1911. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Brazil and St. Vincent. **Cardwell-Quinn and others.**

Thirteen photographs of the State of Bahia, Brazil, and St. Vincent. *Presented by J. S. Cardwell-Quinn, Esq.*

Mr. Cardwell-Quinn has seen a good deal of the West Indies and Brazil as an engineer, and taken advantage of his opportunities to obtain some interesting photographs, a selection of which he has presented to this Society.

(1) A portion of the Serra das Umburanao near Villa Nova da Rainha (Bomfim); (2 and 3) Landscape near Villa Nova da Rainha (Bomfim); (4) Group of Carnauba palms near Chique-Chique; (5) Bahian types of men and women; (6) The "mixed" youth of the State of Bahia. Students of the Government Agricultural Station; (7 and 8) Rio Sergipe and the Government Agricultural Station; (9) Landing-place at Saõ Bento das Lages; (10) The Bay of Itapagipe; (11) The land of the "Reconcaso" of Bahia.—St. Vincent: (12) Bird rock; (13) Rocks at St. Vincent.

Burma and China. **Pereira.**

Fifty-one photographs of the British Shan States and China, taken by Major George Pereira, C.M.G., D.S.O. *Presented by Major George Pereira, C.M.G., D.S.O.*

Major Pereira has lately been travelling extensively in China, and has visited little-known parts of the country. He has sent home to the Society some useful maps of his journeys, and now has added to our collection by the series of photographs of which the titles are given below.

(1) Cave dwellings in loess, Kuli-hua; (2) Cart stuck in road east of Sa-la-chi-li. (3) Bridge over T'ung Ho at An-ting Hsien; (4) Mules at broken road near Pai-shui-chiang; (5) Lung-tung-k'an pass south of Lüch-yang Hsien; (6) Stone bridge at Chao-t'ien; (7) Chia-ling river south of Chao-t'ien; (8) Chao-t'ien-kuan; (9) Buddhist figures on river-bank north of Kuang-yüan Hsien; (10) Horse crossing stone bridge south of Ta-mu-shu; (11) Horse and boy on steps near Chien-mên-kuan; (12) Pagoda opposite temple at Han-yang-p'u; (13) Magistrate's coffin at Han-yang-p'u; (14) Horse descending steps near Han-yang-p'u; (15) P'ai-lou (arch) south-west of Lo chiang Hsien; (16) Mount O-mei, view near top looking down; (17) Bronze pagoda on summit of Mount O-mei; (18) View from summit of Mount O-mei looking south; (19) Carrying women up Mount O-mei; (20) View on side of Mount O-mei; (21) View on approaching Mount O-mei; (22) Baggage bearers on steepest part of Mount O-mei; (23) Tomb in Kuei-chou; (24) Road to P'ing-yi, Hsien; (25) Back of a Yun-nan house showing upper loft; (26) Nien Chia from Ta-li Fu plain on right, and Chinese Yamen soldier; (27 and 28) Ch'ing-lien-ch'iao over Shun-pi river, west of Hsia-kuan; (29) Looking west over Ta-li Fu plain, with city below mountain; (30) Li-ao people on road east of Ch'u-tung; (31 and 32) Mekong bridge looking east; (33 and 34) Mekong bridge from west bank; (35 and 36) Salween bridge from east bank; (37 and 38) Salween bridge looking east; (39) Three "yen-tui" on road west of T'eng-yüeh; (40) T'eng-yüeh bell or drum tower; (41) In Ach'ang village of La-hoa; (42) Pao-wei battalion Kachin soldiers at Pang-wai; (43) Ho-hsa Ach'angs on road near Burma frontier; huts in jungle at Kang-loi hill above Meng-mao; (45) Ning-lum village south of Mahai, British Shan States; (46) Bamboo bridge near Na-long, British Shan States; (47) Salween ferry near Man-tum, north of Kun-long ferry, British Shan States; (48) Palaung village of Kong-hsang, British Shan States; (49) Dugout at Kun-long ferry, British Shan States; (50) La-hu women at Keng-ma market; (51) Keng-ma market.

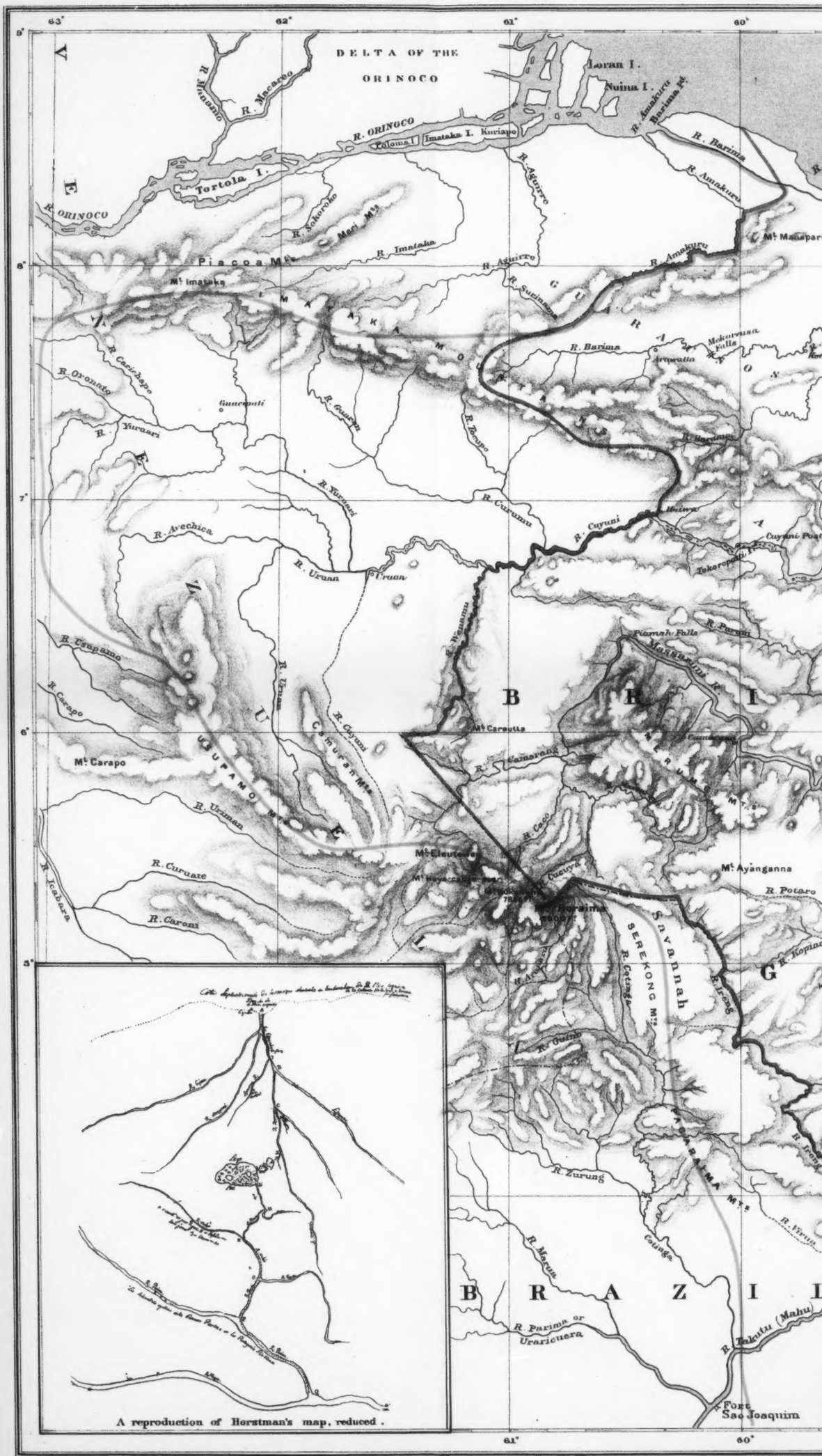
New South Wales. **Vogan.**

Twelve photographs of the Pitt Water District, New South Wales, taken by Arthur J. Vogan, Esq. *Presented by Arthur J. Vogan, Esq.*

Pitt Water is situated on the coast of New South Wales, about 20 miles to the north of Sydney. Many of the bays and headlands have hitherto been unnamed, and the task of naming them has now been entrusted to Mr. J. Vogan, who during his visit on this undertaking took these photographs. Accompanying the photographs is a rough chart indicating their location.

(1) General view of Pitt Water: (2) Looking south-east from Carcel bay; (3) Wharf, Newport; (4) Green point, Scot's bay; (5) Looking south-west over Salt Pan bay; (6) Looking west by south from "Mount Loftus" range; (7) Stokes point; (8) Carcel bay; (9) Carcel point; (10) Looking south from Newport; (11) Dalley's bay, Newport; (12) Sea-coast at Newport.

N.B. It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



A reproduction of Horstman's map, reduced.

The territory to the south not included in the map, lying between 3° and 1° latitude N. has no interest in the Author's paper

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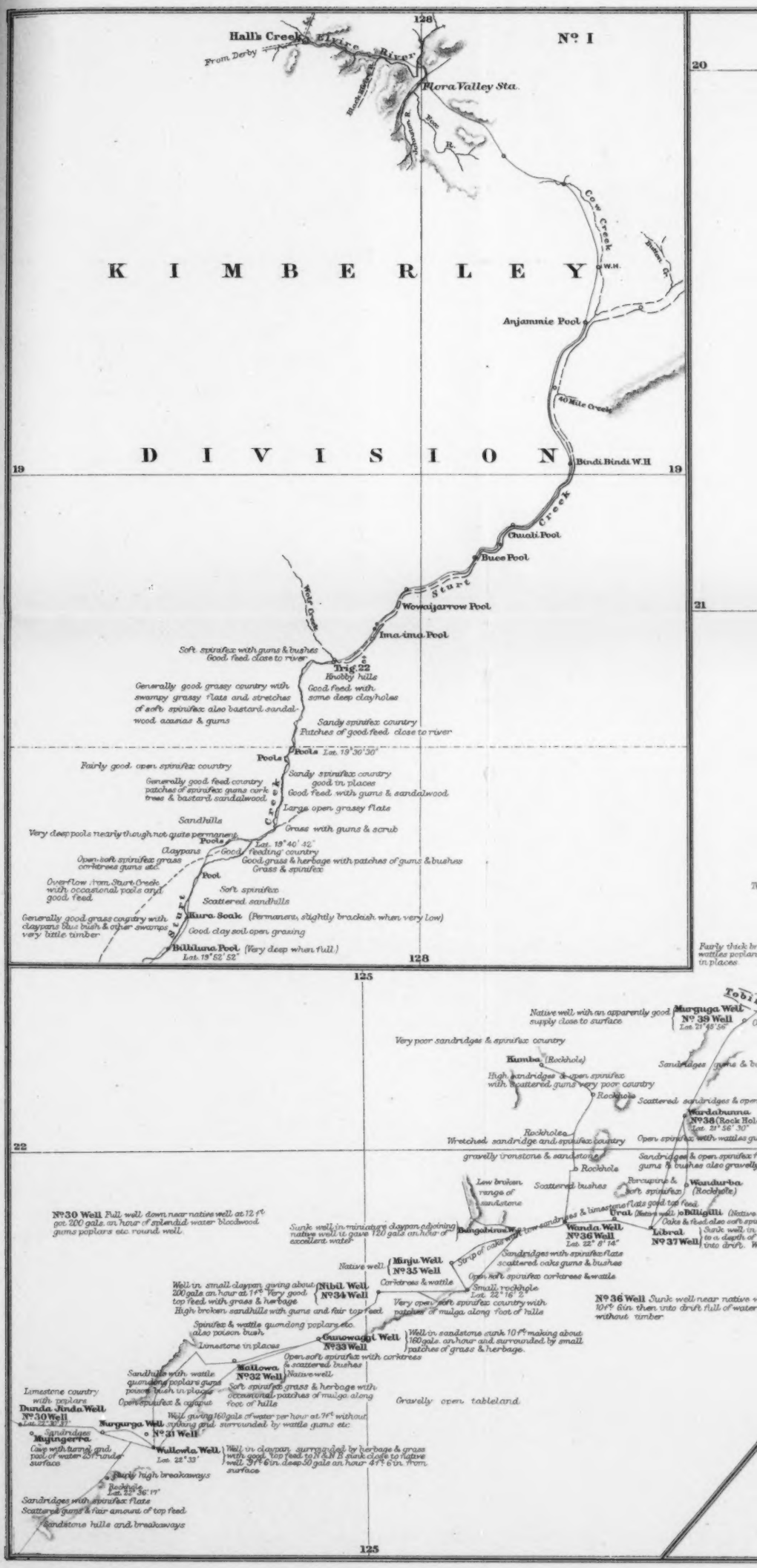
BRITISH GUIANA.
DE VILLIERS.


Nº I
128
20
19
21
22
125
Hall's Creek
From Derby
Elvire River
Flora Valley Sta.
Rocky Hole R.
Mission R.
Cow Creek
W.H.
Bindoon Cr.
Anjammie Pool
40 Mile Creek
Bindi Bindi W.H
Creek
Chuali Pool
Bruce Pool
Sturt
Wowajarrow Pool
Wolf Creek
Ima-ima Pool
Soft spinifex with gums & bushes
Good feed close to river
Trig.22
Rubby hills
Good feed with some deep clayholes
Generally good grassy country with swampy grassy flats and stretches of soft spinifex also bastard sandalwood acasias & gums
Sandy spinifex country
Patches of good feed close to river
Poola
Poola Lat. 19° 36' 36"
Fairly good open spinifex country
Sandy spinifex country good in places
Generally good feed country patches of spinifex gums cork trees & bastard sandalwood
Good feed with gums & sandalwood
Large open grassy flats
Sandhills
Grass with gums & scrub
Very deep pools nearly though not quite permanent
Poola
Lat. 19° 40' 42"
Claypans
Good feeding country
Good grass & herbage with patches of gums & bushes
Open soft spinifex grass corktrees gums etc.
Grass & spinifex
Pool
Overflow from Sturt Creek with occasional pools and good feed
Soft spinifex
Scattered sandhills
Kura Soak (Permanent, slightly brackish when very low)
Generally good grass country with claypans blue bush & other swamps very little timber
Good clay soil open grazing
Billiluna Pool (Very deep when full.)
Lat. 19° 52' 52"
KIMBERLEY
DIVISION
Native well with an apparently good supply close to surface
Very poor sandridges & spinifex country
Rumba (Rockhole)
High sandridges & open spinifex with scattered gums very poor country
Rockhole
Rockholes
Wretched sandridge and spinifex country
gravelly ironstone & sandstone
Rockhole
Low broken rangs of sandstone
Scattered bushes
Porcupine & soft spinifex
Wonduriba (Rockhole)
Sunk well in miniature claypan adjoining native well it gave 120 gals an hour of excellent water
Bungabirra
Low sandridges & limestone flats good top feed
Ural (Native well)
Billigilli (Native
Cake & feed also soft spi
Wanda Well
Nº 36 Well
Lat. 22° 8' 14"
Libral
Nº 37 Well
Sunk well in
to a depth of
into drift.
Nº 30 Well Full well down near native well at 12 ft got 200 gals an hour of splendid water bloodwood gums poplars etc round well
Native well
Minju Well
Nº 35 Well
Sandridges with spinifex flats scattered cakes gums & bushes
Open soft spinifex corktrees & wattle
Well in small claypan giving about 200 gals an hour at 14 ft Very good top feed with grass & herbage
High broken sandhills with gums and fair top feed
Nibil Well
Nº 34 Well
Corktrees & wattle
Small rockhole
Lat. 22° 16' 2"
Very open soft spinifex country with patches of mulga along foot of hills
Nº 36 Well Sunk well near native
10 ft 6 in. then into drift full of water
without timber
Spinifex & wattle quondong poplars etc
also poison bush
Limestone in places
Gunowaggil Well
Nº 33 Well
Well in sandstone sunk 10 ft making about 160 gals an hour and surrounded by small patches of grass & herbage.
Open soft spinifex with corktrees & scattered bushes
Mallowa
Nº 32 Well
Native well
Sandhills with wattle quondong poplars gums poison bush in places
Soft spinifex grass & herbage with occasional patches of mulga along foot of hills
Limestone country with poplars
Open spinifex & calapul
Gravelly open tableland
Dunda Jinda Well
Nº 30 Well
Lat. 22° 30' 11"
Well giving 160 gals of water per hour at 76 ft without pitching and surrounded by wattle gums etc
Nurunga Well
Nº 31 Well
Sandridges
Mujingerra
Camp with tunnel and pool of water 15 ft under surface
Wullowla Well
Lat. 22° 33'
Well in claypan surrounded by herbage & grass with good top feed to N & N E sunk close to native well 3 ft 6 in. deep 50 gals an hour 4 ft 6 in. from surface
Fairly high breakaways
Rockhole
Lat. 22° 36' 17"
Sandridges with spinifex flats
Scattered gums & fair amount of top feed
Sandstone hills and breakaways

WESTERN AUSTRALIA.

THE WILUNA-KIMBERLEY STOCK ROU

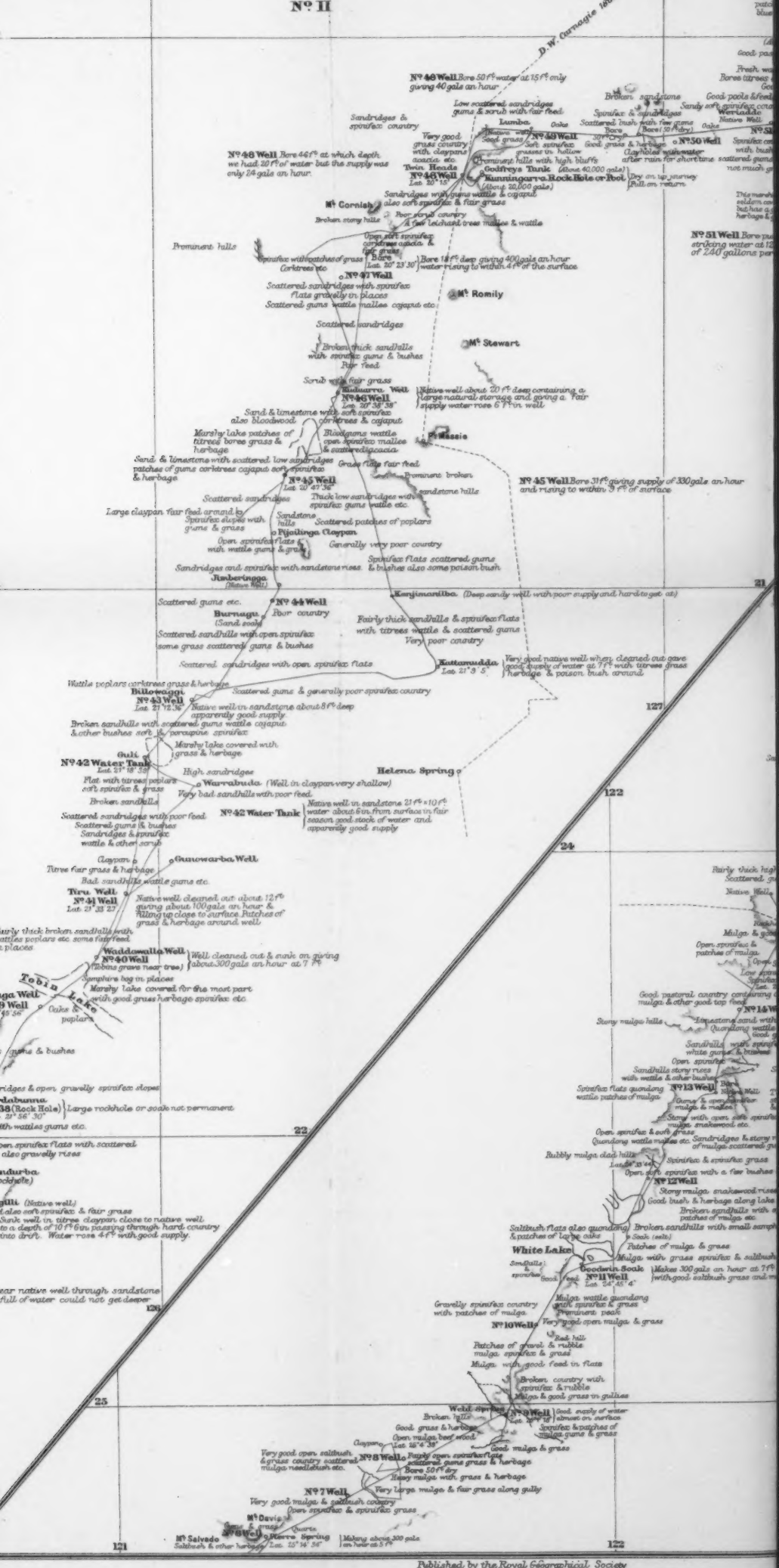
by

A. W. CANNING

1906-07.

Scale, 1,000,000 or 1 Inch - 15·78 Stat. Miles.

10 5 0 10 20 30


126
127
No II
D.W. Carnegie 1896
No 48 Well Bore 50 ft water at 15 ft only giving 40 gals an hour
Low scattered sandridges gums & scrub with fair feed
Broken sandstone
Spinifex & sandridges
Scattered bush with few gums
Sandridges & spinifex country
Lumba.
Very good grass country with claypans acacia etc.
No 49 Well
Soft spinifex grasses in hollow
Good grass & herbage
No 50 Well
Claypans with water after rain for short time
No 48 Well Bore 44 ft at which depth we had 20 ft of water but the supply was only 24 gals an hour.
Twin Heads
Prominent hills with high bluffs
Godfreys Tank. (Above 40,000 gals.)
No 46 Well
Lat. 20° 15'
Kunningarra Rock Hole or Pool (About 20,000 gals.)
Dry on up journey full on return.
Mt Cornish
Sandridges with gums wattle & cajaput also soft spinifex & fair grass
Broken stony hills
Poor scrub country
A few leichhardt trees mallee & wattle
Prominent hills
Open soft spinifex cork trees acacia & fair grass
Spinifex with patches of grass & Corktrees etc.
Bare
Lat. 20° 23' 30"
Bore 18 ft deep giving 400 gals an hour water rising to within 4 ft of the surface.
No 47 Well
Scattered sandridges with spinifex flats gradually in places
Scattered gums wattle mallee cajaput etc.
Mt Romily
Scattered sandridges
Mt Stewart
Broken thick sandhills with spinifex gums & bushes Fair feed
Scrub with fair grass
Kuburra Well
No 46 Well
Lat. 20° 38' 38"
Native well about 20 ft deep containing a large natural storage and giving a fair supply water rose 6 ft on well.
Sand & limestone with soft spinifex also bloodwood
Marshy lake patches of titrees boree grass & herbage
Bloodgums wattle open spinifex mallee & scattered acacia
Mt Bessie
Sand & limestone with scattered low sandridges patches of gums corktrees cajaput soft spinifex & herbage
Grass flats fair feed
Prominent broken sandstone hills
No 45 Well Bore 31 ft giving supply of 330 gals an hour and rising to within 3 ft of surface
No 45 Well
Lat. 20° 47' 58"
Scattered sandridges
Thick low sandridges with spinifex gums wattle etc.
Large claypan fair feed around
Spinifex sloped with gums & grass
Sandstone hills
Scattered patches of poplars
Pjalitinga Claypan.
Open spinifex flats with wattle gums & grass
Generally very poor country
Sandridges and spinifex with sandstone ross.
Spinifex flats scattered gums & bushes also some poison bush.
Jinberinngga (Native Well)
21
Scattered gums etc.
No 44 Well
Poor country
Burnagu (Sand soak)
Karyimarriba. (Deep sandy well with poor supply and hard to get at)
Scattered sandhills with open spinifex some grass scattered gums & bushes
Fairly thick sandhills & spinifex flats with titrees wattle & scattered gums
Very poor country
Scattered sandridges with open spinifex flats
Kattarruddo. Lat. 21° 9' 5"
Very good native well when cleaned out gave good supply of water at 11 ft with titrees grass herbage & poison bush around.
Wattle poplars corktrees grass & herbage
Billowagga
No 43 Well
Lat. 21° 12' 36"
Scattered gums & generally poor spinifex country
Native well in sandstone about 8 ft deep apparently good supply
Broken sandhills with scattered gums wattle cajaput & other bushes soft & porcupine spinifex
Gull
No 42 Water Tank
Lat. 21° 18' 35"
Marshy lake covered with grass & herbage
High sandridges
Flat with titrees poplars soft spinifex & grass
Warrabuda. (Well in claypan very shallow)
Very bad sandhills with poor feed.
Broken sandhills
No 42 Water Tank
Native well in sandstone 21 ft × 10 ft water about 6 in from surface in fair season good stock of water and apparently good supply
Scattered sandridges with poor feed
Scattered gums & bushes
Sandridges & spinifex wattle & other scrub
Helena Spring
122
24
Claypan
Gunowarba Well.
Titree fair grass & herbage
Bad sandhills wattle gums etc.
Tiru Well
No 41 Well
Lat. 21° 33' 27"
Native well cleaned out about 12 ft giving about 100 gals an hour & filling up close to surface Patches of grass & herbage around well
Waddowalla Well
No 40 Well
(Robins grave near tree)
Well cleaned out & sunk on giving about 300 gals an hour at 7 ft
Tobin Lake
Samphire bog in places
Marshy lake covered for the most part with good grass herbage spinifex etc.
Oaks & poplars
Gums & bushes
Ridges & open gravelly spinifex slopes
Large rockhole or soak not permanent.
Open spinifex flats with scattered also gravelly rises
Native well.
Sunk well in titree claypan close to native well to a depth of 10 ft 6 in passing through hard country into drift. Water rose 4 ft 6 with good supply.
Fairly thick high Scattered, g
Native Well
Mulga & g
Open spinifex & patches of mulga.
Low spin
Good pastoral country containing mulga & other good top feed
No 14 W
Stony mulga hills
Limestone sand with Quandong wattle
Good
Sandhills with spinif white gums & bushes
Open spinifex
Sandhills stony rises with wattle & other bushes
Spinifex flats quandong wattle patches of mulga
No 13 Well
Mulga Well
Gums & open spinifex mulga & mallee
Stony with open scrub spinifex mulga snakewood etc.
Open spinifex & soft grass Quandong wattle mallee etc. Sandridges & stony of mulga scattered gu
Rubbly mulga clad hills
Spinifex & spinifex grass
Open soft spinifex with a few bushes
No 12 Well
Stony mulga snakewood rises
Good bush & herbage along lake
Broken sandhills with patches of mulga etc.
Saltbush flats also quandong & patches of Large oaks
Broken sandhills with small samph
Soak (salt)
White Lake
Patches of mulga & grass
Mulga with grass spinifex & saltbush
Sandhills & spinifex
Goodwin Soak
No 11 Well
Lat. 24° 45' 4"
Makes 300 gals an hour at 7 ft with good saltbush grass and w
Gravelly spinifex country with patches of mulga.
Mulga wattle quandong with spinifex & grass Prominent peak
No 10 Well
Very good open mulga & grass
Red hill
Patches of gravel & rubble mulga spinifex & grass
Mulga with good feed in flats
Broken country with spinifex & rubble
Mulga & good grass in gullies
25
Weld Springs
No 9 Well
Lat. 25° 10'
Good easily of water almost on surface
Broken hills
Good grass & herbage
Spinifex & patches of mulga gums & grass
Claypan
Open mulga beef wood.
Lat. 25° 4' 35"
Good mulga & grass
Very good open saltbush & grass country scattered mulga needlebush etc.
No 8 Well
Patchy open spinifex flats scattered gums grass & herbage
Bare 50 ft dry
Stony mulga with grass & herbage
No 7 Well
Very large mulga & fair grass along gully
Very good mulga & saltbush country
Open spinifex & spinifex grass
Mt Davis
Mt Salvado
Saltbush & other herbage
Lat. 25° 14' 56"
Making about 300 gals an hour at 5 ft
121
122
127

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WESTERN AUSTRALIA.

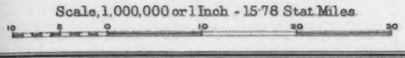
THE A-KIMBERLEY STOCK ROUTE

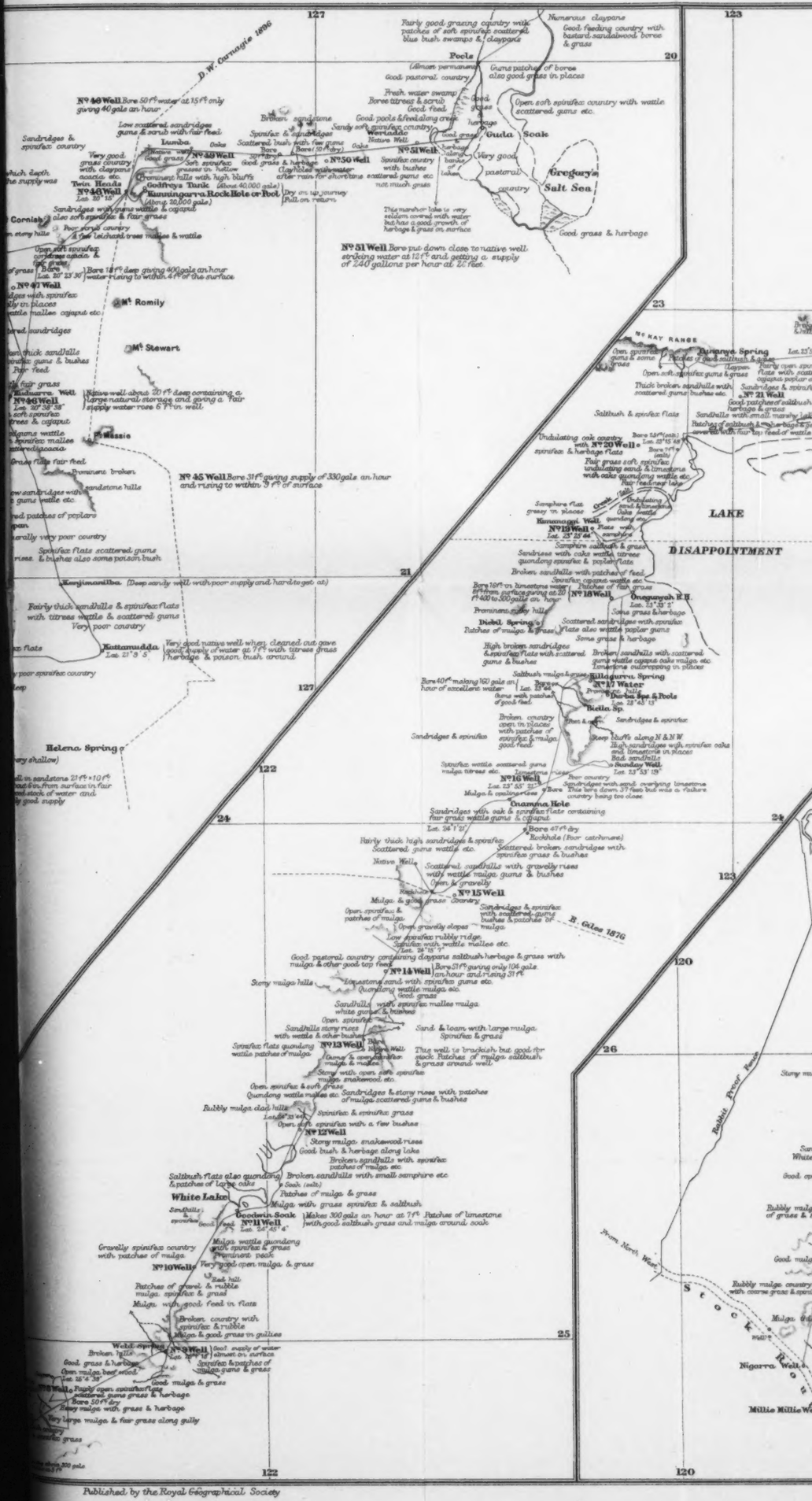
by

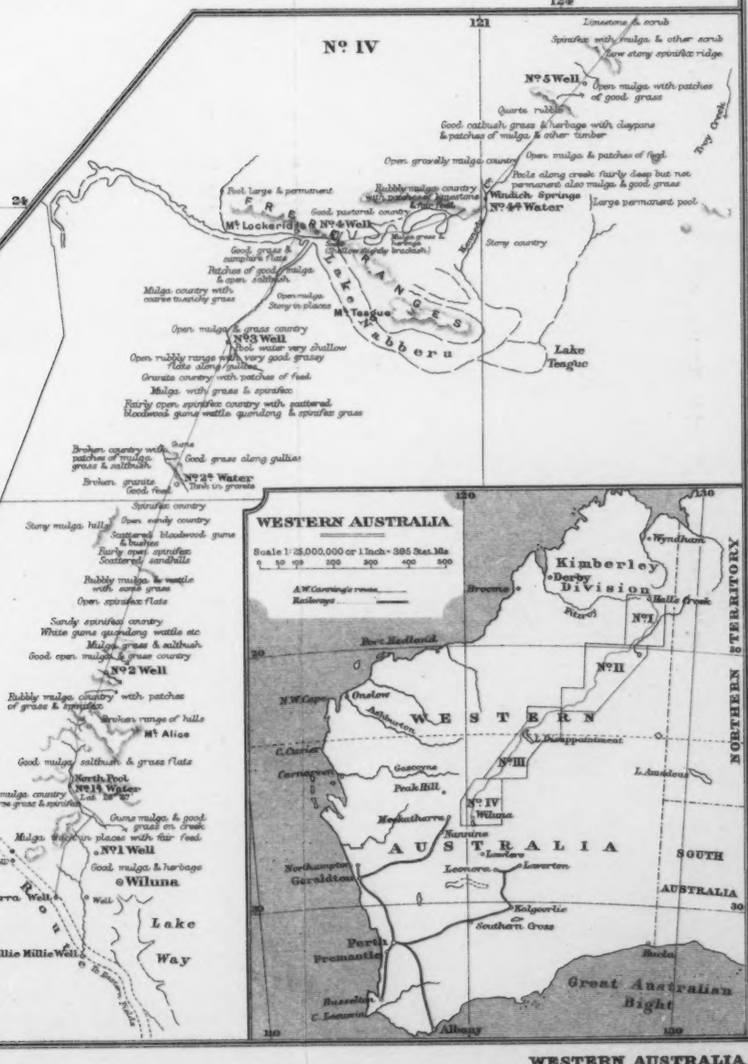
A. W. CANNING

1906-07.

Scale, 1,000,000 or 1 Inch - 15·78 Stat. Miles.




127
123
D.W. Carnegie 1896
Fairly good grazing country with patches of soft spinifex scattered, blue bush, swamps & claypans
Numerous claypans
Good feeding country with bastard sandalwood, boree & grass
Poole
20
(Almost permanent)
Good pastoral country
Gums patches of boree also good grass in places
Fresh water swamp
Boree titrees & scrub
Good feed
Good grass
Open soft spinifex country with wattle scattered gums etc.
Broken sandstone
Good pools & feed along creek
Sandy soft spinifex country
Good feed
Good grass
Herbage along banks of lakes
Guda Soak
Native Well
Oaks
Boree (50 ft dry)
No. 51 Well
No. 50 Well
Very good pastoral country
Gregory's Salt Sea
Spinifex country with bushes scattered gums etc not much grass
This marsh or lake is very seldom covred with water but has a good growth of herbage & grass on surface
Good grass & herbage
No. 51 Well Bore put down close to native well, striking water at 12 ft and getting a supply of 240 gallons per hour at 21 ft.
Sandridges & spinifex country
Lumba
Very good grass country with claypans acacia etc.
Twin Heads
No. 49 Well
Good grass
Soft spinifex grasses in hollow
Godfreys Tank (About 40,000 gals)
Kunningarra Rock Hole or Pool (About 20,000 gals)
Dry on up journey Full on return
Low scattered sandridges gums & scrub with fair feed
Spinifex & sandridges
Scattered bush with few gums
Bore (50 ft dry)
Good grass & herbage
Clayholes with water after rain for short time
Sandridges with gums wattle & cajaput
Cornish
Poor scrub country
A few leichardt trees mulga & wattle
Open soft spinifex cajaputs acacia & tea tree
Bore (Lat. 20° 23' 30")
Bore 18 ft deep giving 400 gals an hour water rising to within 4 ft of the surface
No. 47 Well
Mt. Romily
Mt. Stewart
Native well about 20 ft deep containing a large natural storage and giving a fair supply water rose 6 ft in well.
Massie
Grass hilly fair feed.
Prominent broken
No. 45 Well Bore 31 ft giving supply of 330 gals an hour and rising to within 3 ft of surface
Sandridges with sandstone hills
Gums wattle etc.
Patches of poplars
Very poor country
Spinifex flats scattered gums & bushes also some poison bush.
Kanjimanilba (Deep sandy well with poor supply and hard to get at)
Fairly thick sandhills & spinifex flats with titrees wattle & scattered gums
Very poor country
Kuttamudda Lat. 21° 9' S.
Very good native well when cleaned out gave good supply of water at 7 ft with titrees grass herbage & poison bush around.
Very poor spinifex country
Helena Spring
(very shallow)
Well in sandstone 21 ft & 10 ft about 6 ft from surface in fair supply of water and well stocked with good supply
Very good pastoral country containing claypans saltbush herbage & grass with mulga & other good top feed
No. 14 Well Bore 51 ft giving only 104 gals an hour and rising 31 ft
Stony mulga hills
Limestone sand with spinifex gums etc.
Quondong wattle mulga etc.
Good grass
Sandhills with spinifex mallee mulga
White gums & bushes
Open spinifex
Sandhills stony rises with wattle & other bushes
Sand & loam with large mulga. Spinifex & grass
Spinifex flats quondong wattle patches of mulga
No. 13 Well Bore
Native Well
Gums & over spinifex mulga & mallee
This well is brackish but good for stock Patches of mulga saltbush & grass around well
Stony with open soft spinifex mulga snakewood etc.
Open spinifex & soft grass
Quondong wattle mallee etc.
Sandridges & stony rises with patches of mulga scattered gums & bushes
Rubbly mulga clad hills
Spinifex & spinifex grass
Open soft spinifex with a few bushes
No. 12 Well
Stony mulga snakewood rises
Good bush & herbage along lake
Broken sandhills with spinifex patches of mulga etc.
Saltbush flats also quondong & patches of large oaks
Broken sandhills with small samphire etc.
Soak (salt)
White Lake
Patches of mulga & grass
Sandhills & spinifex
Mulga with grass spinifex & saltbush
Goodwin Soak
No. 11 Well
Makes 300 gals an hour at 7 ft Patches of limestone with good saltbush grass and mulga around soak
Gravelly spinifex country with patches of mulga
Mulga wattle quondong with spinifex & grass
Prominent peak
No. 10 Well
Very good open mulga & grass
Red hill
Patches of gravel & rubble mulga spinifex & grass
Mulga with good feed in flats
Broken country with spinifex & rubble
Mulga & good grass in gullies
No. 9 Well
Good supply of water almost on surface
Spinifex & patches of mulga gums & grass
Broken hills
Good grass & herbage
Open mulga, beef wood
Good mulga & grass
Fairly open spinifex flats scattered gums grass & herbage
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 8 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 7 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 6 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 5 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 4 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 3 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 2 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 1 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
Native Well
Scattered sandhills with gravelly rises with wattle mulga gums & bushes
Open & gravelly
No. 15 Well
Rockholes
Mulga & good grass
Boree
Open spinifex & patches of mulga
Sandridges & spinifex with scattered gums bushes & patches of mulga
Open gravelly slopes
Low spinifex rubbly ridge
Spinifex with wattle mallee etc.
Lat. 24° 15' 0"
B. Giles 1876
Bore 51 ft giving only 104 gals an hour and rising 31 ft
Limestone sand with spinifex gums etc.
Quondong wattle mulga etc.
Good grass
Sandhills with spinifex mallee mulga
White gums & bushes
Open spinifex
Sandhills stony rises with wattle & other bushes
Sand & loam with large mulga. Spinifex & grass
No. 13 Well
Native Well
Gums & over spinifex mulga & mallee
This well is brackish but good for stock Patches of mulga saltbush & grass around well
Stony with open soft spinifex mulga snakewood etc.
Open spinifex & soft grass
Quondong wattle mallee etc.
Sandridges & stony rises with patches of mulga scattered gums & bushes
Rubbly mulga clad hills
Spinifex & spinifex grass
Lat. 24° 23' 45"
Open soft spinifex with a few bushes
No. 12 Well
Stony mulga snakewood rises
Good bush & herbage along lake
Broken sandhills with spinifex patches of mulga etc.
Saltbush flats also quondong & patches of large oaks
Broken sandhills with small samphire etc.
Soak (salt)
White Lake
Patches of mulga & grass
Sandhills & spinifex
Mulga with grass spinifex & saltbush
Goodwin Soak
No. 11 Well
Makes 300 gals an hour at 7 ft Patches of limestone with good saltbush grass and mulga around soak
Lat. 24° 45' 4"
Gravelly spinifex country with patches of mulga
Mulga wattle quondong with spinifex & grass
Prominent peak
No. 10 Well
Very good open mulga & grass
Red hill
Patches of gravel & rubble mulga spinifex & grass
Mulga with good feed in flats
Broken country with spinifex & rubble
Mulga & good grass in gullies
No. 9 Well
Good supply of water almost on surface
Lat. 25° 4' 30"
Spinifex & patches of mulga gums & grass
Broken hills
Good grass & herbage
Open mulga, beef wood
Good mulga & grass
No. 8 Well
Fairly open spinifex flats scattered gums grass & herbage
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 7 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 6 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 5 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 4 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 3 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 2 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
No. 1 Well
Fairly open spinifex flats scattered gums grass & herbage
Good mulga & grass
Bore 50 ft dry
Stony mulga with grass & herbage
Very large mulga & fair grass along gully
Spinifex grass
Bore shows 300 gals
Native Well
Scattered sandhills with gravelly rises with wattle mulga gums & bushes
Open & gravelly
No. 15 Well
Rockholes
Mulga & good grass
Boree
Open spinifex & patches of mulga
Sandridges & spinifex with scattered gums bushes & patches of mulga
Open gravelly slopes
Low spinifex rubbly ridge
Spinifex with wattle mallee etc.
Lat. 24° 15' 0"
B. Giles 1876
Good pastoral country containing claypans saltbush herbage & grass with mulga & other good top feed
No. 14 Well
Bore 51 ft giving only 104 gals an hour and rising 31 ft
Stony mulga hills
Limestone sand with spinifex gums etc.
Quondong wattle mulga etc.
Good grass
Sandhills with spinifex mallee mulga
White gums & bushes
Open spinifex
Sandhills stony rises with wattle & other bushes
Sand & loam with large mulga. Spinifex & grass
Spinifex flats quondong wattle patches of mulga



WESTERN AUSTRALIA
Canning.